ON THE GEOGRAPHY OF TRADE: DISTANCE IS ALIVE AND WELL

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Abstract

It has been widely argued that, with the decline in trade costs (e.g., transport and communication costs), the importance of distance has declined over time. If so, this would be a boon for countries located far from the main centers of economic activity. This paper examines the evolution of countries' distance of trade (DOT) in 1962-2000. We find that the DOT falls over time for the average country in the world, and that the number of countries with declining DOT is close to double those with increasing DOT. Thus, distance has become more important over time for a majority of countries. We examine various hypotheses in order to explain this phenomenon. One conclusion is that the evolution of the DOT is unrelated to that of the overall trade costs but depends on the relative evolution of its components. We also examine the impact on the DOT of changes in production, customs and domestic transport costs; air relative to land and ocean transport costs; competition, exchange rate policy, regional integration, uneven growth, and counter-season trade; and just-in-time inventory management. An interesting finding is that, though regional integration has a negative impact on the DOT, the countries forming trade blocs had a DOT that was growing faster or falling more slowly than that of excluded countries. The paper also offers some insights into how these changes may affect the home bias in consumption and the border effect.

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On the Geography of Trade: Distance is Alive and Well

"The report of my death has been exaggerated."
Mark Twain after reading his own obituary, June 2, 1897

1. Introduction

This paper examines the pattern and evolution of international trade from an economic geography perspective.[1] The integration of the world economy—commonly referred to as "globalization"—has increased rapidly in recent decades. This is manifested, for instance, by the fact that world trade has grown much faster than world GDP.[2] [3] A plausible explanation of the globalization phenomenon that has been set forth is the unilateral trade liberalization and participation in the multilateral trading system undertaken by an increasing number of countries in recent decades. Another one is the decline in trade costs, including transport and communication costs.[4]

A decline in trade costs also suggests that trade should have expanded geographically. In other words, one would expect that as trade costs fall, a larger share of a country's trade would take place further away from its borders, resulting in an increase in the distance of its trade over time. The fall in trade costs and the declining importance of distance over time seems to be a widely accepted stylized fact, as illustrated by the title of Cairncross's 1997 book "The Death of Distance […]".

But have trade costs actually declined? And even if they have, does that necessarily imply an increase in the distance of trade over time? As is shown below, the answer is: not necessarily.

Two kinds of studies have questioned the conventional wisdom that transportation costs have declined in recent decades. First, using detailed data on shipping costs, Hummels (1999a, p. 2) provides evidence that ocean freight rates have increased. As for US air cargo rates, the evidence indicates very large cost reductions between 1955 and

[1] The term "economic geography" is quite old. It was first coined by Keasley in 1901.
[2] World exports accounted for 8 percent of world GDP in 1950 and 20.4 percent in 1999 (Meilke 2000). Since 1950 world GDP has increased by 600 percent while world trade has increased nearly 2,000 percent.
[3] Another important manifestation of globalization, but which is not addressed in this paper, is the increase in international capital flows in recent decades.
[4] Studies have tried to isolate the impact of changes in tariffs, transports costs and others factors on trade growth in the pre-war area (Estevadeordal et al. 2003) and in the post-war area (Rose 1991; Baier and Bergstrand 2001).

1997 (Hummels 1999a, p.5), with air transport concentrated in relatively few places.[5] Hummels also finds indirect evidence that US overland transport costs have fallen relative to ocean freight rates. The decline in US overland transport costs is confirmed by Glaeser and Kohlhase (2003).

Second, a number of studies on the pattern of bilateral trade and the role of transport costs rely on gravity models. These models typically use distance as a proxy for transport costs to explain bilateral trade flows.[6] Though one would expect the (absolute value of the negative) elasticity of bilateral trade with respect to distance to fall with increased globalization, when the gravity model is estimated separately for different years, the elasticity actually increases over time.[7]

Reviewing the literature on trade and distance, Leamer and Levinsohn (1995, pp.1387-88) note that "[...] the effect of distance on trade patterns is not diminishing over time. Contrary to popular impression, the world is not getting dramatically smaller". As pointed out by Brun et al. (2002) and Coe et al. (2002), other authors have failed to find a declining coefficient of distance over time and most have found a significant increase in the absolute value of the estimated coefficient. Disdier and Head (2003) perform a meta-analysis of the distance coefficient estimated with gravity equations in 51 published and unpublished empirical studies. Their main conclusion is that the impact of distance on trade is increasing over time in a way that is statistically significant.[8]

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[5]For instance, over 30% of the value of US trade in 1998 was done by air, compared to 7% in 1965.

[6] Exceptions are Limao and Venables (2001) and Baier and Bergstrand (2001) who use the cif/fob ratio on a few OECD countries, and Hummels (1999b) who uses explicit data of freight rates for the US, New Zealand and five developing countries. Limao and Venables (2001) estimate the impact of being landlocked and of infrastructure on transport costs and on the volume of trade but do not deal with the evolution of the distance of trade.

[7] For instance, Frankel (1997, table 4.2) finds an elasticity of -0.48 in 1965 and of -0.77 in 1992. Similarly, Smarzynska (2001), in a gravity model that includes the relative distance to the center of world trade, finds for intra-OECD trade an elasticity that increases in absolute value from –0.68 in 1970 to -0.97 in 1990. In Leamer's (1993) work, distance coefficients do not fall between 1970 and 1985.

[8] Exceptions are Brun et al. (2002) and Coe et al. (2002), who estimate a gravity model that is closer to its theoretical foundations, as defined in Anderson and Van Wincoop (2003). The coefficient of distance presents no clear trend when estimated with the standard log-linear specification of the gravity model in cross-section over several years by Coe et al. (2002) or in panel over 35 years by Brun et al. (2002). However, Coe et al. (2002) find that when the model is estimated non-linearly with an additive error term, the coefficient for the distance variable shows a decline between 1975 and 2000. Brun et al. (2002) introduce an augmented transport cost function (with indices of infrastructure, the price of oil, and the composition of trade as arguments) into the log-linear specification of the gravity model, and find a decline in the coefficient of distance of about 11% over the 35 year period for the whole sample, though the decline is largely confined

There are several problems with trying to infer the evolution of transport costs from the evolution of the distance coefficient in gravity models. First, the decision about changes in the level of trade at different distances does not depend on changes in the *level* of transport costs but on changes in the relative importance of the components of transport costs (see Section 4.1). Second, that decision depends also on other trade-related and non-trade costs (see Section 4.2). Third, that decision depends not only on costs but also on benefits (see Section 5). Fourth, the decision to trade at a specific distance depends on its costs and benefits *relative* to the costs and benefits of the alternatives, namely, trading at other distances (including at distance zero, i.e., not trading at all). Fifth, and relatedly, the coefficient of distance measures the *marginal* impact of distance on bilateral trade. Thus, an increase in the absolute value of the coefficient of distance means that a marginal increase in the distance of trade (DOT) has become more costly or less beneficial. It need not indicate how average or total trade costs (or benefits) have changed. As is shown in Section 4, countries may trade at greater distances over time even though trade costs have increased.[9]

This paper examines the evolution of the geographic profile of countries' trade over time. Specifically, it examines the evolution of the distance of countries' trade.[10] This issue has not been systematically analyzed in the literature. We find that the distance of trade (DOT) declined over time for a majority of countries, with the US being a major exception[11]. To paraphrase Twain: "The report on the death of distance has been exaggerated."

The fact that the DOT changes over time can be of major economic significance, with implications for countries' welfare, growth and composition of trade. Other things

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to bilateral trade among rich countries; for developing countries, the coefficient of distance does not decline over time.

[9] Evans and Harrigan (2003) also argue that the distance variable in gravity models does not reflect the main cost of transport which is more closely related to the time cost associated with timely delivery. This issue is examine in Section 5.4.

[10] In addition to the evolution of the *average* distance (averaged across trading partners), our data also enable us to examine the evolution of the entire *distribution* of trade according to distance (a sort of Lorenz curve with distance on the horizontal axis and cumulative trade share on the vertical axis). The evolution of the latter is not examined in this paper.

[11] In his concluding section (Section V), Hummels (1999a) states that the cost of distant relative to proximate transport has declined over time, and infers that this led to shifts in trade toward distant partners. One may conclude from this that the distance of trade (DOT) increased over time. His conclusion is certainly correct for the US (see Section 2), to which much of his data pertain.

equal (including total trade), technological or policy changes that make trade with distant countries relatively less attractive (more costly or less beneficial) over time compared with trade with proximate countries can be very costly for countries that are located far from the large economic centers and major producers of technology. Such an evolution may constrain their trading opportunities, choice of goods and access to technology.[12]

Obstfeld and Rogoff (2000) examine the home bias in consumption and other puzzles in international macroeconomics, which they attribute mainly to the cost of international trade. This paper examines how factors that affect the evolution of the DOT over time also affect the evolution of the home bias in consumption and the border effect.[13]

The analysis provided here deals with the goods market. This is a dimension of globalization that has been of great interest to economic historians (O'Rourke and Williamson 2000, p. 3). However, a number of arguments presented here are likely to be relevant for the trade in services as well.[14]

The remainder of the paper is organized as follows. Section 2 provides information on the average DOT in 1962-2000 for the world's main regions and main representative countries, as well as some rank ordering of the DOT by industry. Section 3 provides evidence on the evolution of the DOT in 1962-2000 for different countries, regions and the world as a whole. This is presented in summary tables for exports, imports and total trade, as well as in a series of figures. Section 4 presents hypotheses related to the evolution of the DOT over time due to changes in the relative cost of trade at various distances. It also provides a model of choice between air and ocean transport. Section 5 presents hypotheses related to changes in the relative benefits of trading at various distances, and estimates the impact of several determinants of the evolution of the DOT examined in Sections 4 and 5. Section 6 concludes. Appendix 1 describes the data and several variables of interest.

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[12] See Keller (2002) for an analysis of the impact of distance on technology spillovers.

[13] For an analysis of the border effect, see for instance, McCallum (1995), Wei (1996), Helliwell (1996), Hillberry (2000) and Anderson and Van Wincoop (2003).

[14] Glaeser and Kohlhase (2003) examine the evolution of transport costs for goods, services and people in their analysis of the evolution of US cities and regions.

2. AVERAGE DISTANCE OF TRADE (DOT) ACROSS REGIONS, COUNTRIES AND PRODUCTS

Countries benefit from proximity to the center of world activity and are penalized for being far from it. Since much of the world's economic activity takes place in North America and Western Europe (averaging about 60% of world GDP in 1962-2000, though declining some over time), being located in these regions or close to them provides economic benefits (lower trade costs, better information, positive technological and institutional spillovers, and more). One indicator of a country's proximity to the world center of economic activity is its DOT.

The average DOT (ADOT) for 1962-2000 for various countries and regions is presented in Table 1.[15] What are the main results? First, the ADOT is about 50% larger for non-OECD countries than for OECD countries, putting the non-OECD countries at a significant disadvantage. Second, within the OECD, the EU-15 and Canada have the smallest ADOT (about 2,800 kms), followed by the US (about 6,800 kms), Japan (8,500 kms), Australia (11,850 kms) and New Zealand (12,300 kms). Third, within the EU-15, the ADOT of the UK is some 40% larger than that of France (though with the fastest rate of decline for the UK over the period, as discussed in Section 3).

Fourth, when ranked by continent/region, the ADOT is smallest for the EU-15 (2,800 kms), larger for MENA[16] (4,590 kms), over double the EU-15 ADOT in the Americas (6,160 kms), followed by Sub-Saharan Africa or SSA (7,790 kms), Asia (8,085 kms), and South America (8,180 kms). Fifth, no country's ADOT is below 5,000 kms in either South America or SSA. And sixth, ranked by regional trade bloc, the EU has the smallest ADOT, followed by CARICOM (4,845 kms), the CACM (4,935 kms), UEMOA (5,335 kms), the Andean Pact (6,700 kms), the EAC (7,110 kms), ASEAN (7,435 kms), MERCOSUR (8,625 kms), and SACU (9,930 kms).

The analysis of the evolution of the DOT over time in this paper is performed for aggregate trade in non-fuel goods. Obviously, the DOT varies by product category. For instance, Leamer and Storper (forthcoming, Table 1) show, at the two-digit SIC level, for intra-OECD trade plus trade between the OECD and developing countries (i.e., excluding

[15] See Appendix 1 and Table A.1 for details about the sample used in this paper.
[16] MENA stands for the Middle East and North Africa.

South-South trade), the share of trade done with distant countries and with adjacent countries (as well as with island countries) for 1985, a year in the middle of our sample period. The value of (non-island) world trade with distant relative to adjacent countries is .64 for printing and publishing, .70 for wood, .73 for transport equipment, .96 for furniture, 1.05 for paper and paper products, 2.93 for tobacco, 3.0 for wearing apparel, 3.07 for leather, 3.7 for miscellaneous manufacturing (e.g., toys and umbrellas) and 3.8 for footwear. This paper only deals with the DOT and its evolution for the category of non-fuel products, though product-level analysis is on our research agenda.

3. Evolution of Distance of Trade (DOT) Over Time

3.1. Notation and Definitions

For each country, region, and for the world as a whole, we can calculate the distance of trade (DOT) and its evolution over time. This can also be calculated separately for exports, imports and trade (exports plus imports).

Denote the value of the *non-fuel* trade flow between countries *i* and *j* at time *t* by Z_{ijt}, with Z = M, X, T, and

M_{ijt} = total non-fuel imports of country *i* from country *j* at time *t* (cif value);

X_{ijt} = total non-fuel exports of country *i* to country *j* at time *t* (fob value);

T_{ijt} = total non-fuel trade between country *i* and country *j* at time *t* ($M_{ijt} + X_{ijt}$).

Denote the share of the non-fuel trade flows between country *i* and *j* in the total non-fuel trade of country *i* at time *t* by s_{ijt}^{Z}, with:

$$s_{ijt}^{Z} = \frac{Z_{ijt}}{\sum_{j=1}^{n} Z_{ijt}}, \quad j = 1, ..., \text{n (the n partners of country } i\text{)}, \quad Z = M, X, T.$$

Denote the distance between countries *i* and *j* by d_{ij}. Then, the distance d_{it}^{Z} of country *i*'s trade at time *t* is:

$$d_{it}^{Z} = \sum_{j=1}^{n} d_{ij} s_{ijt}^{Z}, \quad Z = X, M, T, \tag{1}$$

and the world's DOT at time *t* is:

$$d_{wt}^{Z} = \sum_{i=1}^{N} d_{it}^{Z} s_{iwt}^{Z} \text{ , } i = 1, ..., \text{N (N countries in the world), Z = X, M, T,} \tag{2}$$

where s_{iwt}^{Z} represents the share of country i in world trade at time t. For the DOT of a specific region R, the summation in equation (2) is over the countries i =1,..., r of region R, and s_{irt}^{Z} is the share of country i's trade in the total trade of region R.

The evolution of these DOTs can be examined for individual countries, for regions, and for the world as a whole. These calculations have not been undertaken in the literature and are most informative, as is shown below. We compute the distance of exports, imports and total trade for 150 countries and 39 years (1962-2000) from the COMTRADE bilateral (non-fuel) trade data and the spherical distance between the main economic cities of any pair of countries (distance d_{ij} between country i and j).[17] The total number of observations on the DOT is 5,777 for imports, for exports and for total trade (see details in Appendix 1, Table A.1 and Table A.2 on the sample used).

We graph the evolution of the distances of imports and exports (in logarithm) over 1962-2000 and the corresponding estimated trend for different regions of the world and some main representative countries in Figures 1-10. The trend refers here to the estimated value of β in the following regression (OLS with the White correction for heteroskedasticity):

$$\ln d_{it}^{Z} = \alpha + \beta t + \mu_{it} \text{ , } t = 1, ..., 39 \text{ ; Z = X, M, T.} \tag{3}$$

We use the estimated trend, $\hat{\beta}$, to compute what we refer to as the "change" Δd_{i}^{Z}, i.e. the percentage difference in the fitted value of the distance $\hat{d}_{it}^{Z}$ between 1962 and 2000, i.e.:

$$\Delta d_{i}^{Z} = 100 * \frac{\hat{d}_{i2000}^{Z} - \hat{d}_{i1962}^{Z}}{\hat{d}_{i1962}^{Z}} \text{, } \hat{d}_{it}^{Z} = \mathrm{e}^{\hat{\alpha}+\hat{\beta}t} \text{, i.e., } \Delta d_{i}^{Z} = (e^{38\hat{\beta}} - 1) * 100 \text{ , Z=X,M,T,} \tag{4}$$

and we consider the "change" as being *empirically* significant if and only if $\left|\Delta d_{i}^{Z}\right|$ >5.5%. Δd_{i}^{Z} is reported in Table 1 for the World, regions, and some countries and trade blocs.[18] The trend $\hat{\beta}$ is reported in Table 2 and shown in Figures 1-10.[19]

[17] See Appendix 1 for data sources.
[18] See also Figures 1-10 for the corresponding change in kilometers.

3.2. Evolution of the Distance of Trade (DOT), 1962-2000

3.2.1. World and Individual Countries

According to Table 1 and Figure 1.a, the World, whose DOT over 1962-2000 averages some 4,850 kms, presents no empirically significant change in the average distances of imports and exports in 1962-2000: Δd_w^X is about -2.5% and Δd_w^M is about 2.9%[20]. Though the changes over the entire period seem relatively small, Section 3.3 shows variation in the trends across sub-periods, as suggested by Figure 1.a.

Moreover, in addition to the trend of the DOT for the World as a whole, we also estimate the trend of the DOT for the *average country* in the world. This is done by running regression (3) for $\ln(d_{it}^Z)$ on the whole sample. This is reported in Table 1[21]. We find significantly larger negative changes in the DOT for the average country (-12.0% or -662 kms for imports, and -5.3% or -256 kms for exports), compared to the changes for the World as a whole (+2.9% for imports and -2.5% for exports)[22]. The difference between the results of the two regressions indicates that countries with negative trends are relatively small in terms of their share in world trade.

These results are confirmed by the figures reported in Table 1. In fact, at the country level, Table 1 shows a predominance of negative trends in the DOT. The table presents some of the main countries in each region of the world. Out of these 28 countries, we find that: i) 17 countries have a significantly negative change in the distances of imports or exports (Argentina, Australia, Colombia, China, Hong Kong, India, Italy, Japan, Kenya, Mexico, New Zealand, Philippines, Spain, Taiwan, United Kingdom, Uruguay, Zimbabwe); ii) only 4 countries have a significant positive change in the distance of

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[19] See also Tables A.3 for the corresponding p-value and number of observations.

[20] Figure 1.a shows a difference between the World's average distances of imports and exports. The first reason is that some countries are missing in our sample because of definitional changes during the period (e.g. the 15 ex-USSR countries). Second, the difference between cif and fob values in the weights of d_{ij}^M (distance weighted by the cif value of imports) and d_{ij}^X (distance weighted by the fob value of exports) combined with different cif/fob ratios at different distances may explain a part of this difference. For instance, with a cif/fob rate higher for trade with long distance partners, we should have $d_i^M > d_i^X$, which corresponds to what is observed in Figure 1.a, particularly in the 1990's.

[21] The results reported in Tables 1 and 2 are obtained with OLS. The results are not qualitatively different when we use the "Within" estimator by introducing country fixed effects in equation (3).

[22] These correspond to a trend (β) of about –0.14% for exports and –0.34% for imports for the average country, instead of –0.06% for exports and +0.08% for imports for the World as a whole (see Table 2).

imports or exports (Brazil, Cote d'Ivoire, Senegal, USA); iii) 5 countries present significant opposite changes in the distances of imports and exports (Cameroon, Canada, France, Ghana, Thailand); and iv) 2 countries have non-significant changes (Nigeria, Republic of Korea).

In the entire sample of 150 countries, we find that i) 77 countries (51.3%) have a significant negative change in the distance of imports or exports; ii) 39 countries (26%) have a significant positive change in the distances of imports or exports; iii) 30 countries (20%) present opposite changes in the distance of imports and exports; and iv) 4 countries (2.7%) have non-significant changes.

Thus, about twice more countries show an empirically significantly negative as opposed to a positive change in the distance of exports or imports over time (77 countries versus 39 countries, respectively, or a ratio of 1.98).[23]

3.2.2. Regions and Sub-Regions

The changes in the DOT for the world as a whole are essentially due to the OECD[24], as it represents, on average in 1962-2000, 73% of world imports and 80% of world exports in the sample (see Table A4). As in the case of the world as a whole, the OECD shows opposite changes in the distances of exports and imports between 1962 and 2000, but contrary to the world's case, these changes are empirically significant, with -7.0% for exports and +8.7% for imports (see Table 1 and Fig. 1c).

The positive change in the distance of imports observed in the OECD and at the world level is in great part due to the US, which represents around 15 % of world imports in 1962-2000[25] and shows a 30% increase in the distance of its imports (or an increase of 1878 kms) between 1962 and 2000 (see Table 1 and Fig. 6d). In fact, the World without the US shows a significant decrease in the distance of imports of about 7 % (see Table 1 and Fig. 3a).

[23] Recall that we consider a change from 1962 to 2000 to be empirically significant if it is larger than 5.5% in absolute value. See Table A.5. for the list of countries in each category. If we consider a change in DOT to be empirically significant if it is larger than 10% in absolute value, then the number of countries with negative changes remains much larger than the number with positive changes (70 negative to 41 positive or a ratio of 1.72).

[24] OECD is defined here as the OECD according to the 2000 definition, i.e., with 23 countries (actually 22 in the sample because Belgium and Luxembourg are considered as one country in COMTRADE).

[25] See Table A.4.

As shown in Table 1, except for the US, with a strongly positive change of 8% for exports and 30% for imports, and Canada, which presents strongly opposite changes of -42% for exports and +36% for imports (see also Fig. 6b), most of the other OECD countries show strong negative trends: the EU[26] (for the 15 members as a whole) with -12% and -13% for exports and imports, respectively (see also Fig. 1d), Australia (-23% for exports and -20% for imports, Fig. 5a), Japan (-17% for exports and -25% for imports, Fig. 5b), and New Zealand (-40% for exports and -23% for imports).

As shown in Table 1 and Fig. 1b, non-OECD countries trade significantly closer to home over time, with a decrease of 14% in the distance of imports (-943 kms), and a decrease of around -7% for exports (-524 kilometers). However, there is much variation within the non-OECD group, with negative evolutions in the DOT in the two largest developing regions, Latin America and Caribbean (LAC)[27] and Asia, and positive evolutions in the smaller regions of Sub-Saharan Africa (SSA) and Middle East and North Africa (MENA). The changes in 1962-2000 are: LAC: -23% for exports and -10% for imports (see also Fig. 3.c); non-OECD Asia: -9.8% for exports and -26% for imports; SSA: +3% for exports and +12% for imports (see also Fig. 2.c); and MENA: +57% for exports and +21% for imports (see also Fig. 2.d).

Table 1 also presents the change in the DOT in a number of sub-regions, including the Andean Pact, ASEAN, CACM, CARICOM, EAC, MERCOSUR, NAFTA, SACU and UEMOA in 1962-2000. We refer here to these sub-regions in their geographical capacity and do not examine the impact of trade bloc formation in this section. The analysis of the impact of the creation of trade blocs on the distance of trade is taken up in Section 5.1.

Table 1 shows a significantly negative change in the distance of imports or exports. The change in 1962-2000 in sub-regions of South and Central America are strongly negative, especially for the distance of exports: MERCOSUR: -8.4% for exports and -2.5% for imports (see also Fig. 9.a); CACM: -24.2% for exports and -11.6% for imports (Fig. 9.b); the Andean Pact: -18.3% for exports and -8.4% for imports (Fig. 9.c); The exception is CARICOM which shows no significant change (-1.3% for exports and +3.0% for imports, Fig. 9.d).

[26] Europe (EU-15) represents around 45% of the world imports and exports in the sample, see Table A.4.
[27] Or, equivalently, the Americas without Canada and the US.

Similarly, the Eastern and Southern African trade blocs show a fall in the DOT (EAC: -37.6% for exports and -12.6% for imports, Fig. 8.c; and SACU: -13.9% for exports and -0.2% for imports, Fig. 8.a). For the ASEAN, the figures are -11.4% for imports and +0.6% for exports (Fig. 10.a). The main exceptions to the negative changes over time are NAFTA (-3.5% for exports but +38.4% for imports, see Fig. 6.a) and the West African Economic and Monetary Union (WAEMU or UEMOA), with +13.9% for exports and +23.2% for imports (see Fig. 8.b). The changes in the DOT in NAFTA are of course dominated by the changes in the US.

3.3. Evolution of the Distance of Trade (DOT) Over Sub-Periods

What about changes in the DOT over sub-periods? According to Table 2, the World distances of imports and exports, which (as noted earlier) show no significant trend over the entire period 1962-2000, actually decrease in 1962-1979 and 1980-1989 and then strongly increase in the 1990s.[28] As shown by Figures 1.c and 1.d, these evolutions are strongly influenced by those of the OECD group, which are themselves largely based on the evolutions in EU-15 both for the large decrease in 1964 -1978 and for the large increase during the 1990s.[29] The evolutions in EU-15 (a strong decrease in 1962-1979, a smaller but significant decrease in 1980-1989, and an increase in the 1990s) are quite representative of the evolutions in the individual countries of the EU, as shown in Figures 4a-4d.

In contrast, the non-OECD countries as a whole (Fig. 1.b) present a long decline over the entire period for the distance of imports and, for the exports, a small increase over 1962-1986 followed by a strong decrease.

As noted above and emphasized in Figures 2a-2d, the evolutions differ across regions. First, Figure 2.a shows that, in the Americas, the distance of imports increased from 1968 to 1988 and then slightly decreased (with a trend, $\hat{\beta}$ equal to –0.46% in 1990-2000 in Table 2), whereas the distance of exports started to strongly decline from 1980. These evolutions are essentially due to those in the NAFTA region, as shown by Fig. 6.a

[28] Note however, in Fig. 1.a, the strong increase in the distances of both imports and exports in 1979-1984.

[29] Actually, if we graph the evolutions of the DOT of the World *without* the EU-15, there is a positive trend during the 1970s followed by a long and strong decrease from about 7007 kms in 1982 for imports (6652 kms for exports) to 6087 (6180) kms in 2000.

(Figs. 2.a and 7.a are almost identical, which is to be expected as NAFTA represents about 85% of the trade in the Americas, see Table A.4), and is particularly due to the US (see Fig. 6.d). Without the US or NAFTA, the distance of imports in the Americas (respectively Fig. 3.b and 3.c) presents a slight decline whereas that of exports decline significantly from the end of the 1980s. As noted earlier, these strong negative evolutions, generally higher for exports, and with a strong acceleration in the decline from the mid-1980s, are largely confirmed in Latin America and the Caribbean at the sub-regional level for MERCOSUR, the CACM and the Andean Pact (see Fig. 9).

Second, Figure 2.b reveals a long decline in Asia (stronger after 1985) in the distances of exports and imports. This general decline is quite representative of the evolutions of the main countries of the Asia region, as shown by Figures 5.a-5.d (decline over the whole period in Australia and Japan and for imports in China and India) and Figures 10.a-10.d (decline in Hong-Kong, Philippines and in the ASEAN from the beginning of the 1980s).

Third, Fig. 2.c indicates a strong instability in the distances of Sub-Saharan Africa's imports and exports over time, with a positive and weak general trend for the entire region as well as for the sub-regions of West Africa over the whole period (but a significant negative trend in the distance of total trade in 1990-2000 equal to -0.16% for SSA and -0.43% for West Africa; see Table 2). Eastern and Southern Africa present no significant change in the distances of imports and exports over the whole period, due in fact to a positive trend until 1980 and then a negative one in 1980-2000 for both imports and exports. We find the same tendencies at a sub-regional level, as shown in Figures 8: a slight overall positive trend in the DOT in the UEMOA with a significant decline in 1990-2000 (Fig. 8.b), and a negative trend, significant since 1980, in the average distance of exports for SACU and the EAC (Figs. 8.a and 8.c).

Finally, for MENA (Fig. 2.d), most changes are positive, with a 20.5% change in the distance of imports (952 kms) and 57.3% in exports (1841 kms) in the whole period, except for some negative trends in 1980-1989 in the distance of imports and trade in general, due to the evolutions in the Middle East sub-region.

In the next two sections, we examine a series of hypotheses about the factors affecting the evolution of the DOT over time. Sections 4 deals with hypotheses related to costs and Section 5 deals with those related to benefits.

4. TRADE COSTS AND THEIR IMPACT ON THE DISTANCE OF TRADE (DOT) AND ITS EVOLUTION

The main general results of Section 3 are that

i) though there was little change in the DOT for the World in 1962-2000, the DOT for the average country fell over the period;

ii) the number of countries for which the DOT fell is close to double the number of countries for which the DOT increased over the period; and

iii) the DOT fell in the main developing regions of LAC and Asia and rose in the smaller region of MENA and somewhat in SSA.

The fact that, despite the decline in transport and communication costs, the DOT fell for the average country and fell in many more countries than it rose over time, is puzzling. This section sets out a number of hypotheses about factors that are likely to affect a country's or region's DOT and its evolution.

We are unable to formally test all the hypotheses presented due to a lack of internationally comparable time-series data.[30] Some of the main sources of time-series data are Hummels (1999a, 1999b, 2000) but these deal mostly with the US. The World Bank is starting a major data collection effort in the frame of the Trade and Transport Facilitation Program, but it will take some time until the data are collected and become available[31]. Nevertheless, it is important to examine all the potential factors that may affect the DOT and its evolution, first, to obtain a better understanding of this important aspect of globalization; and second, because increased data availability over time (such as those

[30] Section 5.2.1 estimates the impact of changes in dwell and distance costs, as well as other variables, on the evolution of the DOT in 1964-2000.

[31] The departments involved are the Transport and Urban Development Department and the Trade Department.

collected at the World Bank and elsewhere) may enable additional hypotheses to be examined in the future.

The factors that have led to the change in the DOT can be classified into two groups, those related to the cost and those related to the benefit of trading at various distances. For those countries where the DOT declined over time, either the cost fell relatively more (or increased relatively less) for short than for long distances, or the benefit increased relatively more (or fell relatively less) for short than for long distances, or a combination of both.

This section examines the cost determinants of the evolution of the DOT, of the home bias, and of the border effect over time as well as across countries. The benefits aspects are analyzed in Section 5.

4.1. Transport costs

The analysis focuses first on transport costs.[32] Divide transport costs (TC) into two parts, those unrelated to the distance traveled and which are referred to as "dwell" costs (L), and those related to the distance traveled, i.e., distance costs (DC). Dwell costs include port storage costs, the cost of loading and unloading ships (including the time cost), the time cost of queuing outside the port waiting to be serviced, and all other port costs. Total transport costs TC equal the sum of these two components, i.e.:

$$TC = L + DC. \tag{5}$$

Distance costs DC equal cost per mile (C_m) multiplied by distance in miles (m), i.e.,

$$DC = C_m m, \tag{6}$$

where "cost per mile" includes fuel costs and all other costs of operating ships, including overhead and costs of manning and leasing ships.[33] Combining (5) and (6), we have

$$TC = L + C_m m. \tag{7}$$

Transport costs TC to a given location can fall either because of lower dwell costs L or because of lower costs per mile C_m. Though both a decrease in dwell costs and in distance costs have the same effect of increasing trade, they have opposite effects on the

[32] As is shown in Sections 4.2 and 4.3 below, other trade-related costs, including communication costs, as well as non-trade costs, also affect the DOT.

[33] As examined in Section 4.1.1, the per-mile cost C_m need not be constant.

DOT. Lower distance costs C_m raise the incentive to trade with more distant locations because their transport cost TC falls relatively more than for closer locations. This results in an increase in the DOT. On the other hand, lower dwell costs L raise the incentive to trade with closer locations, thereby reducing the DOT. This is because a reduction in dwell costs L implies a larger proportional decrease in transport costs for small distances than for large ones.[34]

The log derivative of transport cost TC, for a trip of given distance m, is

$$d(\log TC) = \frac{L}{L + C_m m} d(\log L) + \frac{C_m m}{L + C_m m} d(\log C_m). \tag{8}$$

Thus, the percentage change in transport costs is a weighted average of the percentage change in dwell cost L and in cost per mile C_m. It is clear from equation (8) that the elasticity of TC with respect to cost per mile C_m increases with m, and the elasticity of TC with respect to dwell cost L falls with m. The derivative of $d(\log TC)$ with respect to m is:

$$\partial(d \log TC) / \partial m = \frac{L * C_m}{(L + C_m m)^2} (d \log C_m - d \log L), \tag{9}$$

implying:

$$\partial(d \log TC) / \partial m \gtreqless 0 \Leftrightarrow d(\log C_m) \gtreqless d(\log L). \tag{10}$$

Thus, if dwell costs L fall proportionately more than distance costs C_m, i.e., if $d(\log L) < d(\log C_m) < 0$, then $\partial(d \log TC) / \partial m > 0$, i.e., the reduction in transport costs TC is smaller as distance m increases. Thus, despite the fact that transport costs fall, as long as L falls proportionately more than C_m, it becomes relatively more attractive to trade at closer distances and the DOT falls.

What do the data tell? There is little information on the evolution of port costs, though some changes in technology point to a decline in these costs. For instance, containerization started in 1966 on North Atlantic routes, then spread to North America-Asia and Europe-Asia routes by the early 1970s. Though the share of world tonnage shipped by container increased from 2% to 55% in 1970-1996, it increased faster and earlier in the US, from 40% in 1970 to 55% by 1979 (Hummels 1999a). He cites an

[34] The analysis assumes competitive port charges that reflect actual costs. Section 4.2 allows for non-competitive price-cost margins in production and distribution.

UNCTAD (1970) study that found large reductions in port labor costs and time in port, and increased ship speed and cargo holding capacity, though the increased speed and size of ships came at the expense of higher capital and fuel costs.

Though containerization lowered both dwell and distance costs, it is likely that the cost reduction was larger for the dwell (port) component. Moreover, containerization reduced the cost of the inland movement of goods by facilitating their transfer between different shipping modes. In that case, $d(\log L) < d(\log C_m) < 0$, implying $\partial(d \log TC)/\partial m > 0$ (equation (10)) and a reduction in the DOT.

The "border effect" in trade is defined as the difference between domestic and international trade where the two types of trade only differ by the fact that the latter needs to cross a border. The difference may be due to the cost of crossing the border (including port and customs costs) and differences in the laws, institutions, currencies, and more. By reducing port costs, containerization reduced the importance of the border effect. Finally, with the fall in both dwell and distance costs, total trade increased and the home bias in consumption declined.[35]

Though there are few if any time series on port costs outside the US, cross-country information is available. Based on the "Global Competitiveness Report" published by the World Economic Forum (2000), Wilson et al. (2003) have created an index of countries' port efficiency, with Singapore being the best (1.000) and Bolivia the worst (.261). More recently, Egypt created a state-of-the-arts port at Ain Suhkna on the Red Sea which is privately managed and with integrated customs. Other things equal, countries with more efficient ports should have a smaller DOT, home bias in consumption and border effect.

Port workers in a number of countries are unionized. This is likely to raise port costs, not just because of higher wages but because of restrictions on the number of hours worked. For instance, Chilean port workers had historically worked one shift a day, and the liberalization of the port labor market was equivalent to a tripling of port capacity and a reduction in port time for ships. This is likely to have reduced the DOT, the bias in home consumption and the border effect.

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[35] As noted above, containerization took place first in OECD countries, though the difference in the cross-country degree of containerization is likely to have diminished after some time as more of the poorer countries improved their port infrastructure.

What about the evidence on the evolution of distance costs? Hummels (1999a) argues that for charter shipping bulk commodities (on a worldwide basis) as well as for general or liner cargo (for ships loading and unloading in Germany and the Netherlands), including containerized vessels, the cost per value shipped has risen since 1952 (see Figure A.1) [36]. Unfortunately, the figures for liner cargo include port costs. However, port costs are not included for charter or tramp shipping. Thus, at least in the latter case, the increase in distance costs should have a negative impact on the DOT. Note also that, though charter shipping cost per value shipped has risen, the cost per quantity shipped has fallen (and the latter has fallen for liner cargo relative to the cost per value shipped). This seems to indicate either that the value of goods per ton shipped over water declined or that their composition changed, with the more valuable products shipped by liner or by air. We return to this issue in Section 4.1.1.

So far, we have focused on transport by ship[37]. International trade between neighboring countries is typically made over land. The most important illustration is intra-EU trade, though overland transport among neighboring countries is also important among members of NAFTA, among South American and Central American countries, in Sub-Saharan Africa, and more.

Hummels (1999a) uses indirect evidence suggesting that overland transport costs in the US declined relative to ocean transport costs. The decline in US overland transport costs is confirmed by Glaeser and Kohlhase (2003) who find that the cost of moving a ton a mile by rail has declined since 1890 by 2.5% a year, and that trucking costs have been falling by 2% a year since the Motor Carrier Act of 1980. They attribute the decline in overland transport costs to improved transport technologies and to the fact that the value of

[36]Note that Lundgren (1996), for a smaller sample, concludes that the constant dollar price of shipping bulk commodities fell substantially between 1950 and 1993, though—according to Hummels (1999a, p.2)—not the ad-valorem barrier of shipping bulk commodities. Second, freight costs may have fallen in recent years because of a change in market structure for liners, with the shipping cartels (Conferences) no longer in control, and because fixed shipping routes have been created which operate on a continuous basis and where distance is likely to be less important for countries on or close to these routes. The change in freight costs for countries located far from these routes is ambiguous.

[37] Hummels (1999a, p.5) states that case study evidence shows that ocean freight comprises only a third of total door-to-door shipping charges, and this fraction has changed little overtime. A 1967 OECD study about shipments between OECD trading partners showed that ocean freight comprised between 38% and 64% of total door-to-door shipping charges. Livingston (1986) found that ocean freight typically comprised one-third or less of total shipping costs from European to African partners.

goods lies increasingly in quality rather than quantity.[38] They also find a positive relation between products' value per ton and the distance hauled, with a highly significant elasticity of .32.

The fall in overland shipping costs has provided an incentive to increase overland trade, resulting in an increase in the DOT over land but in a reduction in the overall DOT (due to the increased share of overland trade). This would also apply to other regions than the US where this relative cost evolution took place.

Fluctuations in the price of oil would also be expected to affect the DOT. Prices increased at the time of the oil embargo in 1973 and rose again in the early 1980s (see Figure 11). This led to higher shipping costs, as shown by spikes in the tramp shipping rates and liner price indexes in Hummels (1999a, Figs. 1 and 2). The increase in distance costs C_m relative to dwell (port) costs L is predicted to have led to a reduction in the DOT. Real oil prices have declined since the early 1980s and this is predicted to have led to an increase in the DOT.

Finally, we examine the effect of exchange rate policy on the DOT. Many dwell costs are typically in local currency (e.g., port labor costs) while distance costs are typically quoted in US dollars. Thus, one can rewrite equation (7) to include the exchange rate as follows:

$$TC = L/\pi + C_m m, \tag{7'}$$

where π is the exchange rate (units of local currency per US dollar).

Assume that an exporting country suffers from inflation, with dwell costs rising together with local prices. If the exchange rate depreciates at the same rate as prices increase (whether by policy or through market forces), then L/π remains unchanged. However, if the exchange rate depreciation lags behind the rate of inflation,[39] dwell costs L/π will rise relative to distance costs, the cost of distant trade will rise proportionately less than that of proximate trade, and the DOT will rise. On the other hand, a sudden devaluation will have the opposite effect.

[38] Interestingly, they find that the cost of moving people within cities in the last three decades has increased for all size classes of cities, mainly due to increased congestion but also to increased real per capita income.
[39] The well-known phenomenon of "atraso cambiario," as is commonly referred to in Latin America, where the exchange rate has often been used in an attempt to slow down inflation.

4.1.1. Air versus Ocean Shipping

Assume that exporters must choose between air and ocean shipping. Hummels (2000) estimates the value of shipping time to be very high (about .5% ad-valorem per day saved), with the increased speed of transport (air shipping and faster ocean vessels) between 1950 and 1998 being equivalent to a reduction in tariffs from 20 to 5.5%, and with saving time becoming less expensive because of the reduction in the price of air shipping relative to ocean shipping.

We develop a simple model of choice between air and ocean shipping to examine the impact of changes in several variables of interest on the DOT. Assume an exporter who is shipping goods of value V and weight (or bulk) W to a location at distance m. The distance costs of ocean shipping DC_O and air shipping DC_A have two components, the opportunity cost of the money invested in the merchandise being shipped and the shipping fee. We have:

$$DC_O = rV(m/S_O) + (a_O + b_O m)W; DC_A = rV(m/S_A) + (a_A + b_A m)W \,, \tag{11}$$

where r is the interest rate, V is the value of the goods shipped, S_O (S_A) is the speed of travel by ocean (air), $a_O + b_O m$ ($a_A + b_A m$) is the fee charged for ocean (air) travel per unit of weight (or bulk) W and is assumed to be linear in the distance m. The fee for air travel is higher than for ocean travel, i.e., $a_A > a_O > 0$ and $b_A > b_O > 0$. Thus, we have economies of scale with respect to distance m but not with respect to weight (or bulk) W.[40] The trip lasts a time equal to m/S_i (i = O, A), and $rV(m/S_i)$ can be thought of as the interest cost (or alternatively as the value of having goods arrive on time at a given destination; see Section 5.4).

As long as $DC_O < (>) DC_A$, goods travel by ocean (air). We solve for the distance m_i where $DC_O = DC_A$ and the exporter is indifferent as to the shipping mode. Shipping at any distance $m < (>) m_i$ takes place by ocean (air). As m_i falls (increases), the share of exports shipped by air increases (falls). The solution for m_i is:

[40] Including economies of scale with respect to W as well does not affect the results.

$$m_i = \frac{S_O S_A (a_A - a_O)}{r\frac{V}{W}(S_A - S_O) + (b_O - b_A) S_O S_A}. \tag{12}$$

Equation (12) implies:

$$\begin{aligned} &\partial m_i / \partial S_A < 0, \partial m_i / \partial S_O > 0, \partial m_i / \partial r < 0, \partial m_i / \partial V < 0, \partial m_i / \partial a_A = -\partial m_i / \partial a_O > 0, \\ &\partial m_i / \partial b_A = -\partial m_i / \partial b_O > 0, \partial m_i / \partial W > 0. \end{aligned} \tag{13}$$

Thus, the share of shipping by air increases with the speed of air travel, with interest rates, with the value of the goods shipped relative to their weight (and/or bulk), with ocean shipping costs, and decreases with the speed of ocean travel and the cost of air travel.

Over time, the speed of air travel increased (so did the speed of ocean vessels though less), its cost decreased, the weight (and/or bulkiness) of many goods decreased, and the composition of production--and therefore exports--towards lower weight/higher valued goods increased. For instance, the share of light manufactures in the exports of developing countries to developed ones increased from 5% in 1955 to 58% in 1992 (Hillman, forthcoming). These changes led to a rise in the share of air transport over time and in the DOT. As reported by Hummels (1999a), this is especially true for the US where these changes were more important and occurred earlier, and may explain the rise in the DOT over time for both US exports and imports.

If rV in equation (12) is interpreted as the value of timely delivery of goods, then an increase in the value of timely delivery (say, because of the development of just-in-time inventory technology) raises the share of goods shipped by air. This is further examined in Section 5.4.

The model was solved for the distance m_i for which the cost is the same whether the product is shipped by air or by sea. The model could also have been solved for the bulk W_i or the value V_i (or any other variable) for which both costs are the same.

4.2. Additional Trade and Non-Trade Cost Determinants of Changes in DOT

So far, we have examined the consequences for the DOT of changes in the dwell and distance components of international transport costs. Other trade-related costs as well as *non-trade* costs also affect the DOT. Most are examined here, with communication costs examined in Section 4.3. We abstract here from exchange rate issues, which were examined in Section 4.1. We also abstract from international production fragmentation, which is examined in Section 5.4.

The cost to consumers in country j of a product imported from country i, P_{ji}, is:

$$P_{ji} = (C_i + MU_i + DT_i + CC_i + L_i + D_{ij} + L_j)\tau_j + t_j + CC_j + DT_j + MU_j, \tag{14}$$

where P_{ji} is the consumer price in country j of a good exported from country i, C_i is the production cost in country i, MU_i is the markup (or price-cost margin) in the exported good's industry in country i, DT_i is the domestic transport cost from the plant to the port in i, CC_i is the cost of customs in i, L_i are dwell costs in i, D_{ij} is the distance cost of shipping the good from country i to country j, L_j are the dwell costs in country j, τ_j is the ad-valorem tariff *factor* (1 + the ad-valorem tariff) in country j (which is assumed to be applied on the c.i.f. value),[41] t_j is the specific tariff in j, CC_j are the customs costs in j, DT_j are the domestic transport costs from the port to the consumption center in j, MU_j is the markup in j, and it is assumed that the ad-valorem tariff is applied on a price that includes dwell costs in j.[42]

Collecting in equation (14) the non-distance costs, NDC, on the one hand, and the distance costs, DC, on the other hand, we have:

$$P_{ji} = [(C_i + MU_i + DT_i + CC_i + L_i + L_j)\tau_j + t_j + CC_j + DT_j + MU_j] + D_{ij}\tau_j, \tag{15}$$

with

$$NDC = (C_i + MU_i + DT_i + CC_i + L_i + L_j)\tau_j + t_j + CC_j + DT_j + MU_j, \tag{16}$$

and

$$DC = D_{ij}\tau_j. \tag{17}$$

A reduction in any of the cost components of NDC provides an incentive to lower the DOT. The only possible exception is the ad-valorem tariff factor τ_j, and we return to this below. For instance, assume that production costs C_i have declined. This lowers the

[41] The US tariffs are applied on the fob value and their impact is examined below.

[42] Note that if exchange rates are taken into account, one would need to include two exchange rates, one applied to the dwell costs of the exporting country and the other to the dwell costs of the importing country.

non-distance costs NDC and the consumer price in country j, P_{ji}. That reduction in P_{ji} is proportionately larger, the smaller is the distance cost DC, i.e., the smaller the distance between countries i and j. Thus, any reduction in NDC (with the possible exception of τ_j) lowers the DOT. Note also that trade increases with any reduction in NDC or in DC. This raises competition and should result in a reduction in the (non-competitive) markups, with a further decline in the DOT.

The cost of some tradables, such as high-tech equipment, has fallen dramatically over time. This has the greatest proportional impact on price at the factory if workers can buy the equipment (say, personal computers) at cost. The proportional price reduction is somewhat smaller in the local store because of additional fixed costs, is smaller still in more distant locations where the price includes domestic transport costs, smaller still in neighboring countries, and smallest in the most distant countries. This implies an increase in the home bias in consumption and a smaller DOT.

Similarly, greater domestic or international competition, whether in the exporting or importing country, reduces the markup and the DOT. The proportional reduction in cost is greatest for domestic consumption. This raises the home consumption bias. Similar results are obtained with a reduction in domestic transport costs, dwell costs, customs costs and in specific tariffs.

What about the ad-valorem tariff factor τ_j? We start with the assumption that the ad-valorem tariff (τ_j-1) is applied to the c.i.f. value of the product, as assumed in equations (14) - (17). A given reduction in τ_j has a larger proportional effect on DC than on NDC. The effect is equi-proportional for DC (see equation (17)), but it is less than equi-proportional for NDC because some of its terms are not affected by a reduction in τ_j, as shown in equation (16). This would provide an incentive to increase the DOT. On the other hand, a reduction in the ad-valorem tariff raises the degree of international market contestability and leads to a reduction in markups. This has the opposite effect of lowering the DOT. Which effect dominates is ambiguous a priori.

The US applies its ad-valorem tariff on the fob value of the product. The fob value does not include transport costs D_{ij} (or dwell costs L_j in j). In that case, equation (17) becomes $DC = D_{ij}$, and a reduction in the US ad-valorem tariff factor τ_{US} lowers the NDC component but not the DC component. This should reduce the DOT for US imports. On the other hand, US tariffs have been low for a while, with a decline from 3.8 to 1.8% in 1989-2001 (World Bank 2003), so that this effect on the US DOT is likely to have been small.

Trade facilitation has played an important role in the area of trade reform in recent years. This issue was added to the set of new trade issues at the Singapore Ministerial of the WTO (1996), and decisions on the modalities for negotiations on trade facilitation, including customs procedures, must be made at the Ministerial Conference of the WTO in Cancun in September 2003. Attempts have also been made to reform customs services unilaterally, sometimes with the help of private companies such as Societe Generale de Surveillance (SGS).

Based on the same report as that used for their port efficiency index, Wilson et al. (2003) built an index of the customs environment. For 'hidden import barriers' created by customs, they find that Finland has the best score (1.000) and Paraguay the worst (.368), while for customs bribery, Iceland has the best score (1.000) and Bangladesh the worst (.343). As in the case of ports, Singapore is among the best in terms of customs efficiency. It has interlinked computer systems and simplified document procedures that allow customs clearance in record time. Trade facilitation and more efficient customs services would be expected to have a negative impact on the DOT, on the border effect and on the home bias in consumption.

The general reduction in the bulkiness and weight of tradable goods (including radios, computers and machinery) resulted in a decrease in distance costs DC, though domestic transport costs and aspects of port costs (such as the cost of storage) may also have declined. It is likely that DC declined proportionately more than NDC, which would have contributed to an increase in the DOT and an increase in the share shipped by air (see equation (13)).

4.3. Communication Costs

Telephone communication has become much cheaper, especially for international calls. And the internet has further reduced communication costs. Taking communications costs into account, equation (16) becomes equation (16'):

$$NDC = (C_i + MU_i + DT_i + CC_i + L_i + L_j + COM_i)\tau_j + t_j + CC_j + DT_j + MU + COM_j$$

and equation (17) becomes:

$$DC = (D_{ij} + COM_{ij})\tau_j \,. \tag{17'}$$

where COM_i (COM_j) is the domestic communication cost in country i (j) per unit of product traded, and COM_{ij} is the international communication cost per unit of product. Communication costs *per unit of time* have typically fallen proportionately more for international than for domestic communications. However, what matters for the impact on the DOT is the cost *per unit of production*.

More precisely, what matters is the comparison between the reduction in $COM_{ij}\tau_j / DC$ and $(COM_i\tau_j + COM_j)/NDC$. And even though the cost per unit of time fell more for international communications, the opposite may well be true for the cost per unit of product. The reason is that the production process is likely to be intensive in domestic communication, especially for products that require coordination across different companies or across units within a company.[43] Moreover, domestic transport also uses communications as an input, and thus DT_i also falls with the reduction in communication costs. Consequently, whether the reduction in communication costs has a greater proportional impact on DC or on NDC is ambiguous, and so is its impact on the DOT and on the home bias in consumption.

An additional effect of cheaper telephone communication and the internet is their effect on competition. For instance, articles appeared in local newspapers in the Washington, D.C. area in the early 2000s about area car dealers complaining that their profit margins had fallen dramatically because potential buyers were able to compare

[43] Use of the internet is larger domestically than internationally, including for intra-firm communication, to pay bills and buy plane tickets, for information on movies, car prices, etc. This is partly explained by the fact that speaking the same language lowers the cost of internet communication and existing business and other ties raise its value. For instance, though access to e-Bay is international, most transactions are between US residents. Thus, the impact of the internet on home bias is ambiguous a priori. See Leamer and Stern (forthcoming) for an analysis of the impact of the internet on the location of economic activity.

prices on the internet at a negligible cost. The reduction in communication costs reduced local monopoly power and the rents associated with it. This should reduce the DOT. Another possibility is that the internet might help make customs more efficient. This should also reduce the DOT and should reduce the border effect.

It would be useful to rank the various factors listed so far in terms of the importance of their impact on the evolution of the DOT. However, data on the evolution of these factors are not available for a large number of countries. The same holds for the factors affecting the benefits of the DOT (see below).

5. Benefit Determinants of Changes in DOT

The classification of the determinants of changes in the DOT in terms of costs and benefits is somewhat arbitrary since the effect of an increase (decrease) in the relative benefit of trading at, say, small distances is equivalent to the effect of an increase (decrease) in the relative cost of trading at greater distances. Nevertheless, the factors examined in this section differ from those in Section 4 (they do not deal with changes in aspects of dwell and distance costs) and it seems useful to maintain this taxonomy.

We examine here four phenomena, namely, regional integration, the uneven economic growth of various countries or regions, counter-season trade, and international production fragmentation and the increasing value of time in trade because of the increasing importance of the ability to respond to fluctuations in demand and supply.

5.1. Regional Integration

By eliminating trade barriers among member countries, regional integration agreements (RIAs) or trade blocs tend to increase the private benefit of intra-bloc trade. RIAs are regional in the sense that they are typically formed between neighboring countries. Examples are NAFTA, the EU, MERCOSUR, the CACM, CARICOM, the Andean Pact, UEMOA, CEMAC, SACU, ASEAN, SAARC, SADC and more.[44] Given that the DOT for intra-bloc trade is typically smaller than for extra-bloc trade, and that

[44] There are some exceptions, such as the FTAs between Chile and Canada, Singapore and the US, Chile and the US, Israel and the US, Chile and the EU, Mexico and the EU, and South Africa and the EU, but most are too recent to be able to be analyzed, and their weight in the total trade associated with RIAs is small.

RIAs tend to raise intra-bloc trade by making it privately more beneficial, RIAs tend to reduce the DOT of its member countries.

Since Viner's (1950) classic work, the static economic effects of RIAs have been examined in terms of the concepts of trade creation and trade diversion. Whether trade creation or trade diversion dominates also affects the impact of RIAs on the DOT. Trade creation increases trade among members of the RIA (without affecting trade with excluded countries) and, given their relative proximity, reduces the DOT. The negative effect of a RIA on the DOT is stronger with trade diversion because, in addition to increasing trade between proximate member countries, it also reduces trade with more distant countries. Thus, for a given increase in trade among member countries, the greater the degree of trade diversion, the larger the reduction in the DOT.

The above deals with the trade policy aspects of RIAs. Some RIAs also involve currency unions (including most of the EU, CEMAC, SACU and UEMOA) and other aspects of deeper integration. These tend to increase intra-bloc trade by lowering its cost, thereby further reducing the DOT.

We examine empirically the impact of (the trade and other aspects of) RIAs on their DOT evolution for eight RIAs. We estimate, for exports, imports, and for total trade (exports plus imports) the regression:

$$\log DOT = \alpha + \beta t + \gamma (RIA * t) + \varepsilon_t\,, \tag{18}$$

where *RIA* is a dummy variable that takes values of zero (one) before (starting when) the RIA is formed or revived, and t is a time trend.[45] The estimation is over the period 1962-2000. Table 4 shows the estimation results.

In the case of exports, we see that the effect of the RIAs on the trend of the DOT is negative for all RIAs except for CARICOM[46], and is significant at the 1% level, except for UEMOA and SADC (without SACU) where the significance level is 5% and 10%, respectively. Abstracting from CARICOM, the average effect of the RIAs on the trend of the distance of exports is -.23%.

[45] The EU is not included because it was formed before the start of our sample period.

[46] The effect of CARICOM was significantly negative with the data without mirror estimates (with a lot of missing data). With the new base, there are fewer missing data but in the case of some small countries, the mirror estimates are dramatically different from the values reported by these countries. If we eliminate these outliers from the regression, the impact of CARICOM is also significantly negative (-0.27%).

In the case of imports, three of the RIAs (MERCOSUR, CARICOM, and the Andean Pact) have no significant impact on the trend in the DOT. The effect of the other RIAs is negative, significant at the 1% level for NAFTA, CACM, and ASEAN, and at the 5% and 10% level for UEMOA and SADC, respectively. The average effect of these RIAs on the trend of the distance of exports is -.26%.

For total trade, all RIAs except for CARICOM (non significant) have a significantly negative impact on the trend of the DOT, significant at the 1% level except for the UEMOA (5%) and SADC (10%). The average effect of the RIAs on the trend of the DOT is -.20%.

In the case of the NAFTA countries, we also examined the impact of both CUSFTA and NAFTA. In other words, we estimated equation (18) with a second dummy variable for CUSFTA (see note c) in Table 3). CUSFTA's effect on the trend of the DOT is significant for imports (at the 5% level, with an effect of -.13%) and total trade (at the 10% level, with an effect of -.08%) but not for exports. As for NAFTA, the results are about the same as those in the regression without the CUSFTA dummy.

Table 3 shows the evolution of the share of US imports and exports by ocean, air and land. First, we note a decline in the share of ocean trade and an increase in the share of trade by air and land. Interestingly, the share of trade by land declines before 1980 and increases thereafter, the latter coinciding with the period when CUSFTA and NAFTA were signed. Approximately the opposite occurs with ocean trade, with the share of imports declining after 1980 while the share of exports declines after 1975.

Based on the RIAs examined, it would seem that regional integration has a large negative impact on the trend of the DOT over time. Following the creation or revival of seven out of eight RIAs, there is either a significant slowdown in the overall positive trend (NAFTA, UEMOA), a change from a positive to a negative trend (MERCOSUR, ASEAN, SADC), or an increase in (the absolute value of) the negative trend (Andean Pact, CACM).

However, regionalism only provides a partial explanation of the decline in the DOT found in a majority of countries. First, as mentioned above, the DOT of the Andean Pact and the CACM exhibit a negative trend before the formation of the RIAs. Second, a lot of non-RIA countries also exhibit a significant negative trend. For the 54 non-RIA countries in the sample (out of 150 countries), 30 (55.6%) have a negative trend and 10 (18.5%)

have a positive trend over the entire sample period, i.e. the ratio of countries with negative to positive trends is 3. For the 96 RIA countries in the sample, 47 (49.0%) have negative trend and 29 (30.2%) positive trend, i.e. the ratio of countries with negative to positive trends is 1.6.[47]

Thus, despite the negative impact of RIA formation on the trend of the DOT, the ratio of negative to positive trends in 1962-2000 is almost twice as large for non-RIA countries than for RIA countries, i.e., the ratio of positive to negative trends of the DOT is almost twice as large for RIA countries. That ratio would of course be larger if the impact of RIA formation were not included. Comparing annual trends of the DOT for imports, we find that the average for RIA countries is 0.398 and the average for non-RIA countries is –0.058. The same qualitative results hold for total trade.[48]

If the term "globalization" is defined as an openness to trade with increasingly more distant countries, we find that it is the more globalizing countries that tend to form RIAs. Thus, on average, it is countries whose trade with proximate countries declines the most (relative to trade with more distant countries) that tend to form RIAs. Could the reason be that there are some positive externalities associated with increasing trade with neighboring countries, such as increased security and other political and institutional benefits (Schiff and Winters 2003), and that such externalities provide an incentive for the more globalizing countries to use regional agreements to capture them? [49]

5.2. Economic Growth

Another issue that can affect the DOT over time is economic growth. Countries that belong to a region that experiences a high rate of economic growth will find it beneficial to trade relatively more with countries of the region. This will tend to lower these countries' DOT. This is the case for the East Asia-Pacific (EAP) region. It grew faster than the world

[47] The RIA group is defined as the countries belonging to the Andean Pact, ANZERTA, ASEAN, CACM, CARICOM, CEMAC, Chile-Canada, EAC, EU, MERCOSUR, NAFTA, SADC, SACU, UEMOA, and Madagascar. See Table A.5 for the list of countries in a RIA per category.

[48] The average trend for exports is not significantly different from zero for either the RIA or the non-RIA group of countries.

[49] Note that if it is correct that regional integration depends partly on the evolution of the DOT, i.e., that it depends on the relative changes in distance and non-distance costs, then using dummy variables to capture the effect of regional agreements on bilateral trade in gravity models may not be appropriate because of potential endogeneity problems.

in 1962-79, 1980-89 and 1990-2000 (Table 5), and the trend of its DOT is negative in all three sub-periods for imports, exports and total trade (Table 2). This is confirmed by Frankel and Wei (1996) who, with the help of a gravity model, find that the increase in trade within East Asia "… can be entirely explained by the rapid growth of the countries." If the region (say, EAP) is located far from the US and the EU, the main centers of economic activity, and grows faster than the US and the EU, the DOT will tend to increase for the latter regions. In that case, the net effect on the world's DOT would be ambiguous.

NAFTA's DOT increased in 1962-1989 and fell in 1990-2000 (Table 2, last three columns). One reason is the formation of CUSFTA and NAFTA, but another likely contributing factor is the high rate of economic growth experienced by the US and the NAFTA region in the 1990s. This is shown in Table 5 where NAFTA's growth rate was lower than the world's average before 1990 and higher in 1990-2000.

The MERCOSUR region grew slightly faster than the world in 1962-79, much slower than the world in 1980-89, and faster than the world in 1990-2000 (Table 5). We do find a strong negative correlation between the differential growth rate with the world and the trend of MERCOSUR's DOT (-.05 in the first period, .20 in the second one, and -.76 in the third one; see Table 2).

Asia's growth rate is higher than the world's in all three sub-periods (Table 5) and the DOT declines in all three sub-periods (Table 2). Of course, the negative correlation does not hold for all regions because the differential growth rate between a region and the world is only one of the factors affecting the evolution of that region's DOT. For instance, comparing the last three columns of Table 2 with Table 5, we see that the negative correlation holds for the non-OECD group in all three sub-periods (faster growth than the world and negative DOT trend) but only holds for the OECD in the last sub-period.

We also tested the effect of economic growth on the DOT in the following manner. We constructed an index that indicates for each country whether high growth occurred mainly in proximate or in distant countries. For each country i, the index of relative growth REG_{it} is:

$$REG_{it} = \frac{\sum_{j \neq i}^{N} d_{ij}(y_{jt} - y_{j,t-1})}{\sum_{j \neq i}^{N}(y_{jt} - y_{j,t-1})}, \; j \neq i; j = 1,...,N, \tag{19}$$

where d_{ij} is the distance between countries i and j, $y_{jt} - y_{j,t-1}$ is the change in GDP and is a proxy for the change in import demand by country j,[50] and N is the number of countries in the world. For any country i, REG_{it} increases (falls) as changes in GDP are larger (smaller) in distant than in proximate countries. We regress the annual proportional change in the DOT of country i (i = 1,…, N) on the annual proportional change in REG_{it} lagged one year, on the assumption that trade reacts to changes in demand with a lag.

One would expect a positive relationship between the proportional change in DOT_{it} and the lagged proportional change in REG_{it}. In other words, REG_{it} increases if the absolute change in GDP is relatively greater in distant countries, and this should result in an increase in the DOT_{it}. The regressions show a positive effect of the lagged proportional change in REG_{it} on the proportional change in DOT_{it}, with an elasticity of 0.1 and significant at the 7% level for exports, and an elasticity of .05 and significant at the 8% for total trade. The reason for the fact that the elasticity for total trade is half that for exports is that the elasticity for imports is very small and not significant. [51]

Another test was performed where a cross-country regression was estimated of the proportional change in the DOT over the entire period (1962-2000) on the proportional change in REG_{it} over the entire period. In the case of exports, we find a significantly positive effect of REG_{it} on DOT, with an elasticity of 1.9. The effect on imports is not significant (see footnote 51). The elasticity is higher here than in the case of lagged annual effects above because this test deals with the long-term effect of changes in REG_{it} on DOT.

[50] In other words, the implicit assumption is that the marginal propensity to import is constant and the same for all countries. Note that all countries in the sample are included, whether country i trades with them or not.
[51] That the level of significance for imports is lower is to be expected. The measure REG_{it} relates directly to the demand for a country's exports. The distance of a country i's imports might increase with relatively high growth in distant countries if this growth is due to technological progress that results in lower costs for tradable goods. However, the high growth in distant countries may be due to other factors, namely to greater efficiency in the non-tradable goods sector, to discovery of new natural resources or to improvements in terms of trade, and these need not raise country i's imports.

5.2.1 Estimation of Determinants of the evolution of the DOT

Lack of data makes it difficult to test the impact of *all* the factors presented in Sections 4 and 5. We use available data to estimate the annual changes in the DOT as a function of two types of trade costs (one related to dwell costs and the other to distance costs, see Section 4) and of two "benefit" determinants (Section 5). On the cost side, the annual change in the price of oil is used as a proxy of the evolution of distance costs.[52] We compute an index of infrastructure that includes the density of roads, paved roads, railways, and telephone lines (see Limao and Venable 2001; Brun et al. 2002)[53]. This index (in annual percentage change) captures both the impact of the evolution of domestic transport costs and of the evolution of dwell costs. The correlation between this infrastructure index and a port efficiency index, for a sample of 44 countries (include 18 OECD countries) for which data on port efficiency in 1998 are available, is 0.70.[54] Similarly, the correlation between this infrastructure index and a custom clearance index is –0.59.[55] On the "benefit" side, we consider the impact of regional integration (dummy equal to one when the country joins a RIA). We separate the impact of the EU from the others RIAs because the EU has reached a degree of integration that is much higher than that of the other RIAs. Finally, the annual change of the variable REG_{it}, presented in the Section 5.2, is also used as an explanatory variable.

The estimated equation is:

[52] We are aware of the fact that technological change can also affect these costs, but lack of data does not allow us to test it.

[53] Each country's infrastructure is measured by an index constructed from four variables from the Canning (1996) dataset: km of road, km of paved road, km of rail (each per sq. km of country area), and telephone main lines per person. We took the mean over the four variables (each being normalized to have a mean equal to one), ignoring missing observations. This is equivalent to assuming that roads, paved roads, railways and telephone lines are perfect substitutes as inputs to a transport services production function. Taking the mean over the non-missing variables implicitly assumes that the missing observations take on average the same value as the non-missing variables (See Limao and Venable 2001, Appendix 1). As the final year of the Canning (1996) dataset is 1995, we used the predicted value of the infrastructure index for 1996 to 2000 according to a quadratic trend estimated by country on the 1962-1995 available data.

[54] The port efficiency index goes from 1 (inefficient port) to 7 (most efficient port) and is based on surveys of representative firms in each country. Source: The Global Competitiveness Report, various years (1996-2000); also available in Appendix B in Clark, Dollar and Micco (2001) for 1998.

[55] The customs clearance index corresponds to the time (median number of days) needed to clear customs, based on surveys performed (by the World Bank) with respect to importers in each country. Source: Appendix B in Clark, Dollar and Micco (2001) for 1998.

$$\left[\frac{DOT_{it} - DOT_{it-1}}{DOT_{it-1}}\right] = \alpha + \beta_1\left[\frac{REG_{it-1} - REG_{it-2}}{REG_{it-2}}\right] + \beta_2 RIA_{it} + \beta_3 EU_{it}$$
$$+ \beta_4\left[\frac{P^{oil}_{it} - P^{oil}_{it-1}}{P^{oil}_{it-1}}\right] + \beta_5\left[\frac{Infra_{it} - Infra_{it-1}}{Infra_{it-1}}\right] + \mu_{it} \qquad (20)$$

The coefficient β_1 is expected to be positive because a positive annual change in REG_{it} reflects an absolute income change that is higher in distant relative to proximate countries. Hence, this is expected to generate an increase in the distance of trade, particularly in exports (see Section 5.2). Note that we use the lagged value of the change in REG_{it} on the assumption that trade reacts with a lag to changes in income of partner countries. β_2 and β_3 are expected to be negative as regional integration agreements (RIA_{it} and EU_{it}) tend to promote trade between member countries which are typically proximate countries (see Section 5.1).

A rise in the price of oil (P^{oil}_{it}) results in a increase in transport costs related to distance, so that β_4 is expected to be negative (see Section 4.1). Finally, β_5 is also expected to be negative because an increase in the infrastructure index ($Infra_{it}$) is likely to reduce dwell costs (through an increase in port efficiency, a decrease in domestic transport costs or both).

Equation (20) is estimated for the annual change of DOT_{it} of imports, exports and total trade by OLS (corrected for heteroskedasticity), with and without country fixed effects. Results for two periods, 1964-2000 and 1990-2000, are reported in Table 6. All the variables have the expected sign and are significant at least at the 10% level (except in the case of the distance of imports in 1964-2000 where only the RIAs are significant, see footnote 51). The results of REG_{it} and RIA_{it} support our analysis as well as the tests presented in Section 5.1 (Table 4) and Section 5.2 (where we found a significant positive effect of the lagged proportional change in REG_{it} on the proportional change in DOT_{it}). The explanatory variable of the price of oil[56] and the Infrastructure index are also used in

[56] Results are robust if we use the price of oil deflated by the world unit value of imports, exports or by the US GDP deflator instead of the spot price index.

Brun et al. (2002) who estimate a gravity model in panel in 1962-1996 and successfully explain the impact of distance on bilateral trade over time.

We hope to add other explanatory variables (specific tariffs, customs efficiency, containerization and others) as more data become available. However, even though equation (20) only includes some of the explanatory variables, so far the results are very promising and support the hypotheses developed in this paper.

5.3. Counter-Season Trade

With the rise in income in the OECD and the reduction in air transport costs, a number of countries in the Southern hemisphere have found it beneficial to increase exports of perishables such as fruits, vegetables, and fresh fish and seafood products, mainly to the OECD. Table 1 shows that the average DOT over the period 1962-2000 is less than 5,000 kms for the world and less than 4,500 kms for the OECD, while the average DOT for Southern Cone countries is above 8,000 kms, that of SACU is above 9,000 kms and that of South-East Asia is about 7,000 kms. Given the large distance between countries of the Southern and Northern hemisphere, it is likely that this type of trade has raised the average DOT for the OECD and for the world as a whole.

5.4. Production Fragmentation and Just-in-Time Inventory Management

Hummels et al. (1998, p. 79) argue that a "… significant feature of globalization is the internationalization of production," which enables firms to benefit by exploiting "… powerful locational advantages, such as proximity to markets and access to relatively inexpensive labor." Feenstra (1998) refers to this phenomenon as the disintegration of production. Locating production close to markets is likely to reduce the DOT. On the other hand, taking advantage of cheap labor has an ambiguous effect on the DOT. Whether geographic fragmentation of the production process raises or lowers the DOT depends on whether the distance to the new (host) countries where production takes place is longer or shorter than the home country's DOT before the change took place. For instance, it is likely that the EU's DOT fell as the EU increasingly subcontracted with firms in Central and Eastern Europe, and the same is true for the US with the growth of maquiladoras in Mexico (even before NAFTA).

New information and communications technologies have developed that enable manufacturers and retailers to track their inventories much more closely. This has become known as "just-in-time inventory management." Consequently, timely delivery has become more important because it is necessary in order to be able to respond quickly to fluctuations in demand or supply in the absence of costly inventories. Quick response to demand or supply shocks would either require air transport from distant locations—which might be prohibitively costly--or delivery from nearby locations. This shift from distant to nearby locations is likely to reduce the DOT.[57]

In a recent theoretical and empirical analysis, Evans and Harrigan (2003) show that US apparel imports where timely delivery matters have increasingly been imported from nearby countries (the Caribbean rather than Asia). These issues were examined in great detail in Abernathy et al. (1999). They deal with the apparel and textile industries, and argue that it is only since the mid-1980s that this phenomenon of "lean retailing" became important.[58] They argue that for apparel manufacturers, the key to success is no longer solely price competition but the ability to introduce sophisticated information links, forecasting capabilities, and management systems.[59]

Abernathy et al. (1999, p.223) claim that "Because time-to-market and the exigencies of short-cycle production are beginning to impact competition in retail-apparel-textile channels, three global regions are emerging: the United States plus Mexico and the Caribbean Basin; Japan plus East and Southeast Asia; and Western Europe plus Eastern Europe and North Africa. Each of these regions includes both advanced economies and developing areas that are close to consumer markets."

In 1991, the main sources of US apparel imports were China, Hong Kong, Taiwan and Korea. China's share of total US apparel imports remained around 15% in 1991-1997, while the share of the three others (Hong Kong, Taiwan and Korea) fell in the same period from 38% to 16%. On the other hand, the share of Mexico grew from less than 4% in 1991 to 11% in 1997, and the share of the Caribbean Basin Initiative (CBI) countries grew to

[57] Of course, this issue is relevant for the DOT only because of the international fragmentation of the production process.

[58] They claim that the driving force behind lean retailing in the US are chains like Wal-Mart, Kmart and other retailers.

[59] This includes, among others, the use of bar codes, electronic data interchange, standard labeling of shipping containers, and modular assembly. Firms that adopted these four practices had significantly higher profit margins than those that did not.

15.8% in 1997. In terms of physical shipments, the share of the four East Asian countries in total US apparel imports fell from 63% in 1984 to 23% in 1997, while the share of Mexico and CBI countries rose from 7% in 1984 to 39% in 1997. According to Abernathy et al. (1999, pp.233-234), these changing shares over time are due in large part to the lean retailing phenomenon. Thus, based on the findings by Abernathy et al. (1999) and Evans and Harrigan (2003), we conclude that the contribution of lean retailing to the DOT has been negative.

6. Conclusion

It has been widely argued that the importance of distance has declined with the reduction in transport and communication costs and the integration of the global economy. This paper presents findings on the evolution of the distance of trade (DOT) for individual countries, regions and for the world. This has not been examined in the literature. We find that the DOT falls over time for the average country in the world, and that the number of countries with declining DOT is close to double those with increasing DOT. In other words, distance has become increasingly important over time for a majority of countries. The paper examines a series of hypotheses in order to explain the evolution of the DOT. One of the conclusions is that the evolution of the DOT is unrelated to that of the overall level of trade costs but depends on the relative evolution of its components. For instance, the DOT falls over time as long as dwell costs fall proportionately more or rise proportionately less than distance costs, irrespective of the direction of change of transport costs as a whole.

The paper also examines the impact on the DOT of changes in production costs, customs costs, domestic transport costs, of air relative to land and ocean transport costs, of competition, exchange rate policy, regional integration, uneven growth, counter-season trade, and of just-in-time inventory management. We show that changes in production costs, domestic transport costs, customs costs and specific tariffs have a similar effect on the DOT as changes in dwell costs. One of the more surprising findings is that, despite the negative impact of regional integration on the DOT over time, the share of countries with a positive trend in the DOT is larger for countries that are members of trade blocs than for countries that are not. The paper also examines the impact of these changes on the home bias in consumption and on the border effect.

We also estimate a regression of the change in the DOT on changes in the relative growth index (REG) variable, in the price of oil, infrastructure and regional integration. Most of the empirical results support our analysis.

In future work, we plan to test some of the hypotheses advanced in this paper more rigorously as additional data become available, and plan to examine the evolution of the DOT at a more disaggregated level. We also plan to examine the evolution of the DOT based on weight and volume rather than on value.

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Table 1: Average Level and Change in the Distance of Trade of Exports d_i^X and Imports d_i^M, 1962-2000

Country/Region	$\bar{d}_i^X$ **b)** (in kms)	$\bar{d}_i^M$ **b)** (in kms)	Δd_i^X **a)** (in %)	Δd_i^M **a)** (in %)	**Categories**
1. World	**4789.6**	**4937.6**	**-2.5**	**2.9**	**0**
average country [c]	5466.6	5653.2	-5.3	-12.0	-
World w/o USA	*4464.8*	*4521.4*	*-2.4*	*-7.0*	-
World w/o EU-15	*6445.0*	*6637.3*	*-5.2*	*0.2*	-
OECD countries	4300.0	4472.7	-7.0	8.7	><
non-OECD countries	6825.0	6253.5	-7.4	-14.0	-
2.1 EU- 15 members	**2699.8**	**2962.5**	**-12.3**	**-13.1**	-
France	*2548.6*	*2726.7*	*8.1*	*-5.9*	><
Italy	*2957.0*	*3082.3*	*1.7*	*-31.0*	-
Spain	*3147.0*	*3666.2*	*-32.2*	*-21.1*	-
United Kingdom	*3987.9*	*3976.6*	*-41.9*	*-36.7*	-
3. Americas	**6008.5**	**6311.8**	**-5.5**	**26.7**	+
Americas w/o USA	4948.0	4906.6	-27.4	-0.3	-
Americas w/o CAN and USA	7188.7	6631.5	-23.2	-10.1	-
South America	8582.1	7778.3	-5.1	2.0	**0**
NAFTA	5664.6	6108.5	-3.5	38.4	+
Canada	*2809.6*	*2796.8*	*-41.8*	*35.9*	><
Mexico	*4410.4*	*5102.4*	*-33.3*	*-8.0*	-
USA	*6697.1*	*7158.5*	*7.8*	*30.0*	+
MERCOSUR	8679.5	8568.4	-8.4	-2.5	-
Argentina	*9127.9*	*9213.7*	*-17.8*	*-9.3*	-
Brazil	*8476.3*	*8304.5*	*5.2*	*7.3*	+
Uruguay	*8409.9*	*7244.8*	*-38.0*	*-22.2*	-
CARICOM	4511.5	5182.3	-1.3	3.0	**0**
ANDEAN Pact	6930.2	6469.1	-18.3	-8.4	-
Colombia	*6071.1*	*6401.6*	*-16.2*	*-1.8*	-
CACM	5029.1	4838.9	-24.2	-11.6	-
4. Asia	**8243.1**	**7924.5**	**-24.2**	**-33.9**	-
Australia	*10718.1*	*12993.0*	*-22.7*	*-20.2*	-
New Zealand	*12602.1*	*12031.4*	*-40.0*	*-23.3*	-
China	*5168.9*	*6330.2*	*-2.5*	*-38.4*	-
Hong Kong, China	*9036.7*	*5097.1*	*-35.6*	*-42.1*	-
Japan	*8416.0*	*8668.4*	*-16.9*	*-24.6*	-
Asia non OECD	7349.6	6706.3	-9.8	-26.0	-
ASEAN	7447.0	7421.0	0.6	-11.4	-
Korea, Rep.	*7192.9*	*6294.5*	*4.94*	*3.96*	***0***
Taiwan	*7732.9*	*6806.7*	*-1.99*	*-6.45*	-
Thailand	*6645.1*	*7329.5*	*39.1*	*-22.3*	><
Philippines	*8665.6*	*7967.7*	*-9.5*	*-33.3*	-
India	*6861.6*	*7633.2*	*-6.2*	*-25.5*	-
5. Sub-Saharan Africa	**7684.0**	**7893.5**	**2.9**	**12.3**	+
SACU	9751.8	10107.1	-13.9	-0.2	-
EAC	6815.3	7403.5	-37.6	-12.6	-
Kenya	*6071.6*	*7547.0*	*-32.3*	*-5.9*	-
Zimbabwe [d]	*6308.4*	*6867.4*	*-6.1*	*-17.9*	-
UEMOA	5096.4	5577.5	13.9	23.2	+
Nigeria	*5570.9*	*6784.0*	*-3.0*	*3.9*	***0***
Senegal	*4775.9*	*5417.4*	*44.2*	*26.4*	+
Cote d'Ivoire	*5349.7*	*5869.5*	*-2.4*	*21.3*	+
Cameroon	*5314.6*	*6053.6*	*-10.7*	*12.7*	><
Ghana	*6759.6*	*6739.6*	*-17.1*	*10.5*	><
6. MENA	**4071.8**	**5106.5**	**57.3**	**20.5**	+

$\boxed{0}$ **No Change**

$|\Delta d_i^X| < 5.5\%$ and $|\Delta d_i^M| < 5.5\%$

$\boxed{-}$ **Negative Change**

$\Delta d_i^X < -5.5\%$ and $\Delta d_i^M < -5.5\%$

or $\Delta d_i^X < -5.5\%$ and $|\Delta d_i^M| < 5.5\%$

or $|\Delta d_i^X| < 5.5\%$ and $\Delta d_i^M < -5.5\%$

$\boxed{+}$ **Positive Change**

$\Delta d_i^X > 5.5\%$ and $\Delta d_i^M > 5.5\%$

or $\Delta d_i^X > 5.5\%$ and $|\Delta d_i^M| < 5.5\%$

or $|\Delta d_i^X| < 5.5\%$ and $\Delta d_i^M > 5.5\%$

$\boxed{><}$ **Opposite Changes**

$\Delta d_i^X < -5.5\%$ and $\Delta d_i^M > 5.5\%$

or $\Delta d_i^X > 5.5\%$ and $\Delta d_i^M < -5.5\%$

a) $\Delta d_i^Z = 100 * \dfrac{\hat{d}_{i2000}^Z - \hat{d}_{i1962}^Z}{\hat{d}_{i1962}^Z}$, with $\hat{d}_{it}^Z = e^{\hat{\alpha}+\hat{\beta}t}$, Z = X, M;

b) $\bar{d}_i^Z = \dfrac{1}{39}\sum_{i=1962}^{2000} d_i^Z$;

c) unweighted country average;

d) average and change calculated on 1965-2000.

Table 2: Trend (in percentage) in the Distance [a)] of:

Country/Region	Exports				Imports				Total Trade			
	1962-2000	1962-1979	1980-1989	1990-2000	1962-2000	1962-1979	1980-1989	1990-2000	1962-2000	1962-1979	1980-1989	1990-2000
1. World	**-0.07**	**-0.52**	**-0.37**	**0.49**	**0.08**	**-0.56**	**-0.23**	**0.79**	**0.01**	**-0.54**	**-0.29**	**0.65**
p-value	***0.08***	***0.00***	***0.33***	***0.02***	***0.12***	***0.00***	***0.50***	***0.00***	***0.85***	***0.00***	***0.41***	***0.00***
World average country	-0.14	0.06	-0.38	-0.53	-0.34	-0.28	-0.35	-0.42	-0.33	-0.16	-0.36	-0.41
p-value	*0.06*	*0.79*	*0.08*	*0.08*	*0.00*	*0.13*	*0.03*	*0.00*	*0.00*	*0.36*	*0.05*	*0.09*
OECD countries (2000)	-0.19	-0.65	-0.77	0.42	0.22	-0.75	0.51	1.30	0.02	-0.70	-0.12	0.91
p-value	*0.00*	*0.00*	*0.11*	*0.09*	*0.00*	*0.00*	*0.21*	*0.00*	*0.73*	*0.00*	*0.78*	*0.00*
non-OECD countries (2000)	-0.20	0.16	0.12	-0.86	-0.40	-0.44	-0.63	-0.74	-0.30	-0.21	-0.16	-0.75
p-value	*0.00*	*0.01*	*0.63*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.07*	*0.00*
2. Europe	**-0.32**	**-1.43**	**-0.52**	**1.45**	**-0.32**	**-1.69**	**-0.48**	**1.60**	**-0.33**	**-1.58**	**-0.49**	**1.52**
EU- 15 members	-0.35	-1.51	-0.61	1.59	-0.37	-1.83	-0.55	1.74	-0.36	-1.70	-0.56	1.66
EU- 12 members	*-0.41*	*-1.63*	*-0.65*	*1.59*	*-0.42*	*-1.95*	*-0.63*	*1.93*	*-0.42*	*-1.82*	*-0.62*	*1.76*
EU- 9 members	*-0.37*	*-1.68*	*-0.55*	*1.69*	*-0.40*	*-2.18*	*-0.53*	*2.18*	*-0.39*	*-1.96*	*-0.53*	*1.93*
EU- 6 members	*0.09*	*-0.85*	*-0.30*	*1.86*	*-0.10*	*-1.43*	*-0.46*	*2.16*	*-0.01*	*-1.19*	*-0.38*	*1.99*
3. Americas	**-0.15**	**0.07**	**-0.90**	**-1.67**	**0.62**	**0.60**	**0.95**	**-0.46**	**0.28**	**0.32**	**0.19**	**-0.88**
Americas w/o CAN and USA	*-0.69*	*-0.12*	*0.14*	*-3.65*	*-0.28*	*0.17*	*-0.20*	*-0.44*	*-0.46*	*0.02*	*0.17*	*-1.91*
NAFTA	-0.09	0.18	-1.25	-1.60	0.86	0.84	1.28	-0.57	0.44	0.49	0.30	-0.90
Canada	*-1.42*	*-0.90*	*-2.83*	*-3.90*	*0.83*	*0.53*	*2.56*	*-0.69*	*-0.30*	*-0.32*	*-0.17*	*-2.05*
Mexico	*-1.06*	*-0.31*	*-2.58*	*-1.48*	*-0.22*	*0.34*	*-0.26*	*-0.47*	*-0.58*	*0.12*	*-1.23*	*-1.18*
United States	*0.20*	*0.31*	*-0.59*	*-0.69*	*0.69*	*0.77*	*0.67*	*-0.55*	*0.49*	*0.53*	*0.30*	*-0.52*
MERCOSUR	-0.23	-0.24	0.66	-1.69	-0.07	0.18	-0.61	0.31	-0.14	-0.05	0.20	-0.76
Argentina	*-0.52*	*-0.69*	*0.56*	*-1.96*	*-0.26*	*0.11*	*-1.19*	*-0.06*	*-0.37*	*-0.34*	*-0.32*	*-0.98*
Brazil	*0.13*	*0.57*	*0.74*	*-1.56*	*0.18*	*0.90*	*0.04*	*0.65*	*0.17*	*0.72*	*0.56*	*-0.64*
CARICOM	-0.03	-0.40	0.78	-0.98	0.08	-0.13	-0.82	0.42	0.06	-0.21	-0.45	0.18
ANDEAN Pact	-0.53	-0.20	-0.10	-1.84	-0.23	0.04	0.04	-0.19	-0.34	-0.08	0.14	-0.82
CACM	-0.73	-0.67	0.73	-1.01	-0.32	-0.01	2.09	-2.28	-0.52	-0.34	1.47	-1.80
4. Asia	**-0.73**	**-0.65**	**-0.54**	**-0.91**	**-1.09**	**-1.01**	**-1.49**	**-0.65**	**-0.90**	**-0.82**	**-0.95**	**-1.24**
East Asia and Pacific (EAP)	-0.81	-0.78	-0.61	-0.72	-1.15	-1.17	-1.56	-1.25	-0.97	-0.96	-1.02	-0.95
Australia	*-0.68*	*-1.17*	*0.03*	*-0.51*	*-0.59*	*-1.03*	*-0.29*	*-0.36*	*-0.56*	*-1.10*	*-0.08*	*-0.34*
China	*-0.08*	*-0.25*	*-2.87*	*4.21*	*-1.28*	*-1.52*	*-2.59*	*-0.44*	*-0.65*	*-0.84*	*-2.48*	*2.04*
Japan	*-0.49*	*-0.21*	*-0.45*	*-0.64*	*-0.74*	*-0.62*	*-1.26*	*-1.46*	*-0.61*	*-0.43*	*-0.72*	*-0.95*
ASEAN	*0.02*	*-0.13*	*0.92*	*-0.72*	*-0.32*	*0.04*	*-0.83*	*-0.95*	*-0.17*	*-0.03*	*-0.03*	*-0.74*
South Asia	0.10	-1.26	1.67	1.26	-0.82	-0.77	-0.62	-0.83	-0.39	-1.03	0.25	0.38
India	*-0.26*	*-1.41*	*1.22*	*0.82*	*-0.77*	*-0.71*	*-0.80*	*-1.01*	*-0.52*	*-1.16*	*-0.01*	*-0.01*
5. Sub-Saharan Africa	**0.08**	**0.43**	**-0.29**	**-0.24**	**0.17**	**-0.06**	**0.47**	**-0.11**	**0.15**	**0.16**	**0.20**	**-0.16**
East and Southern Africa (ESA)	-0.06	0.47	-0.44	-0.48	-0.01	0.27	-0.28	-0.10	-0.03	0.38	-0.30	-0.26
SACU	*-0.39*	*0.15*	*-0.51*	*-0.70*	*0.00*	*0.34*	*-0.48*	*0.09*	*-0.17*	*0.25*	*-0.49*	*-0.24*
ESA w/o SACU	*-0.06*	*0.42*	*0.30*	*-0.73*	*-0.20*	*0.38*	*0.60*	*-1.89*	*-0.16*	*0.39*	*0.55*	*-1.42*
West Africa	0.62	-0.10	1.19	-0.53	0.17	0.42	0.78	-0.37	0.53	0.40	0.54	-0.43
Nigeria	*-0.14*	*0.20*	*1.25*	*-0.37*	*0.10*	*-0.08*	*-0.52*	*0.75*	*0.31*	*0.50*	*-0.59*	*0.83*
UEMOA	*0.34*	*0.09*	*1.29*	*-1.29*	*0.55*	*1.03*	*0.46*	*0.30*	*0.47*	*0.60*	*0.77*	*-0.33*
CEMAC	*0.35*	*-0.01*	*-0.24*	*2.47*	*0.30*	*0.47*	*-0.40*	*0.00*	*0.33*	*0.29*	*-0.46*	*1.04*
6. Middle East and North Africa	**1.19**	**0.95**	**3.41**	**1.43**	**0.49**	**1.03**	**-0.61**	**0.50**	**0.63**	**1.30**	**-0.34**	**0.62**
Middle East	1.03	0.02	0.43	0.96	0.34	0.87	-0.58	0.15	0.44	0.89	-0.23	0.28
North Africa	0.20	0.22	-0.01	1.70	0.36	-0.07	0.33	1.70	0.36	0.34	0.08	1.58

a) 100* $\hat{\beta}$, with $\hat{\beta}$ by OLS from $\ln(d_{it}^{Z}) = \alpha + \beta t + \mu_{it}$, t=1,..., 39; Z = X, M, T

Table 3: US Trade by Transport Mode (% of value)

	Imports			Exports		
year	Ocean	Air	Land	Ocean	Air	Land
1965	69.9	6.2	23.9	61.6	8.3	30.1
1970	62.0	8.6	29.4	57.0	13.8	29.2
1975	65.5	9.2	25.3	58.9	14.1	27.0
1980	68.6	11.6	19.8	54.8	20.9	24.3
1985	60.4	14.9	24.8	43.0	24.5	32.4
1990	57.2	18.4	24.4	38.4	28.1	33.5
1994	51.2	21.6	27.3	34.7	29.3	36.0

Sources: Hummels (1999a, Table 3).

Table 4: Trend (in percentage) in Regional Integration Agreements.

Trade blocs	Date	Countries (available in the sample)	Trend (%) of DOT over 1962-2000								
			Imports			Exports			Total		
			w/o RIA dummy	w. RIA dummy b)		w/o RIA dummy	w. RIA dummy b)		w/o RIA dummy	w. RIA dummy b)	
			Overall t	t a)	RIA*t	Overall t	t a)	RIA*t	Overall t	t a)	RIA*t
NAFTA c)	Created in 1994	Canada, Mexico, USA.	0.855***	1.128***	-0.331***	-0.093	0.101*	-0.236***	0.437***	0.665***	-0.277***
MERCOSUR	Created in 1991	Argentina, Brazil, Paraguay, Uruguay.	-0.066	-0.088	0.021	-0.230***	0.036	-0.258***	-0.136***	0.025	-0.157***
CARICOM	Created in 1974	Antigua and Barbuda, Bahamas, Barbaods, Belize, Dominica, Grenada, Jamaica, St. Lucia, St. Vincent and the Grenadine, Trinidad and Tobago.	0.078	0.173	-0.080	-0.034	-0.727**	0.585**	0.063	-0.026	0.074
CACM	Revived in 1993	Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua.	-0.324***	0.041	-0.405***	-0.728***	-0.541***	-0.208**	-0.519***	-0.234**	-0.317***
Andean Pact	Revived in 1991	Bolivia, Colombia, Ecuador, Peru, Venezuela.	-0.230***	-0.251***	0.020	-0.532***	-0.170*	-0.352***	-0.340***	-0.235***	-0.102***
ASEAN	Revived in 1992	Brunei, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam.	-0.319***	-0.049	-0.279***	0.016	0.201*	-0.192***	-0.157**	0.067	-0.231***
SADC (w/o SACU)	Created in 1980	Angola, Malawi, Mauritius, Mozambique, Seychelles, Tanzania, Zaire, Zambia, Zimbabwe.	-0.293**	-0.050	-0.192*	0.223***	0.362*	-0.110*	-0.085	0.151	-0.186*
UEMOA	Revived in 1994	Benin, Burkina Faso, Cote d'Ivoire, Mali, Niger, Senegal, Togo.	0.548**	0.608***	-0.103**	0.342***	0.543***	-0.245**	0.465***	0.579***	-0.158**

***, **,* indicate significance at 1%, 5% and 10% respectively.
w/o (w.): estimations without (with) RIA dummy
a) **t**: trend over the whole period 1962-2000;
b) **RIA**: dummy equal to 1 since the agreement is created (revived), otherwise 0;
c) if we control for CUSFTA, created in 1989 between Canada and USA, we obtain:

	t	+ CUSFTA*t	+ NAFTA*t
imports	1.222***	-0.126**	-0.272***
exports	0.104	-0.004	-0.235***
total	0.725***	-0.081*	-0.240***

Table 5: Evolution of the GDP per Region.

Country/Region	GDP % of the World GDP				annual GDP growth rate % of the World GDP		
	1962	1980	1990	2000	1962-1979	1980-1989	1990-2000
World	**100**	**100**	**100**	**100**	**5.45**	**3.18**	**2.69**
OECD countries	86.94	84.12	82.85	79.06	5.26	3.02	2.21
non OECD countries	13.06	15.88	17.15	20.94	6.60	3.98	4.76
EU- 15 members	32.11	34.46	31.84	28.91	5.87	2.36	1.70
USA	36.28	26.00	25.99	27.47	3.52	3.17	3.26
Americas	**42.89**	**35.01**	**0.00**	**35.52**	**4.27**	**2.78**	**3.24**
NAFTA	37.23	29.42	29.17	30.77	4.08	3.09	3.24
Latin America and Caribbean	6.60	6.80	5.56	5.89	5.62	1.13	3.28
MERCOSUR	3.90	4.13	3.24	3.39	5.78	0.73	3.14
CARICOM	0.10	0.08	0.07	0.07	4.33	1.97	2.05
Asia	**19.28**	**24.56**	**28.58**	**29.76**	**6.88**	**4.75**	**3.10**
EAP	17.88	23.41	27.12	27.89	7.04	4.71	2.98
South Asia	1.40	1.15	1.47	1.86	4.29	5.71	5.19
China	0.61	0.89	1.58	3.18	7.70	9.29	10.10
Japan	13.66	18.00	19.67	17.36	7.08	4.09	1.41
ASEAN	0.93	1.35	1.78	2.22	7.62	6.10	4.99
Sub-Saharan Africa	**1.37**	**1.23**	**1.11**	**1.04**	**4.82**	**2.14**	**2.05**
MENA	**1.16**	**2.08**	**1.84**	**1.94**	**8.90**	**1.95**	**3.20**

Table 6: Annual Percentage Change in DOT_{it}

1964-2000	**in Exports**		**in Imports**		**in Total Trade**		***Expected Sign***
	OLS	**FE**	**OLS**	**FE**	**OLS**	**FE**	
Annual % change in **REG** (t-1)	0.062*	0.060*	-0.040	-0.015	0.041*	0.038*	+
RIA	-1.023**	-0.824*	-0.416*	-0.492*	-0.618**	-0.687**	-
EU	-1.859**	-1.024*	-0.820**	-0.792**	-1.500**	-0.869**	-
Annual % change in **Oil price**	-0.032**	-0.037*	-0.004	-0.005*	-0.028*	-0.029*	-
Annual % change in **Infrastructure index**	-0.029**	-0.028*	-0.007	-0.001	-0.012**	-0.021*	-
Obs.	*4184*	*4184*	*4185*	*4185*	*4184*	*4184*	
R^2-*adj*	*0.39*	*0.32*	*0.11*	*0.15*	*0.33*	*0.35*	

1990-2000	**in Exports**		**in Imports**		**in Total Trade**		***Expected Sign***
	OLS	**FE**	**OLS**	**FE**	**OLS**	**FE**	
Annual % change in **REG** (t-1)	0.053**	0.038*	0.012	0.009	0.027*	0.015*	+
RIA	-1.553**	-1.462**	-0.816*	-0.498*	-1.008**	-0.567*	-
EU	-0.297*	-0.341*	-0.486*	-0.521*	-0.372**	-0.417*	-
Annual % change in **Oil price**	-0.024*	-0.026*	-0.021**	-0.020*	-0.020*	-0.019*	-
Annual % change in **Infrastructure index**	-0.029**	-0.033**	-0.027**	-0.032**	-0.029**	-0.031**	-
Obs.	*1285*	*1285*	*1285*	*1285*	*1285*	*1285*	
R^2-*adj*	*0.42*	*0.35*	*0.38*	*0.40*	*0.39*	*0.40*	

** and * indicate significance at 5% and 10% respectively.

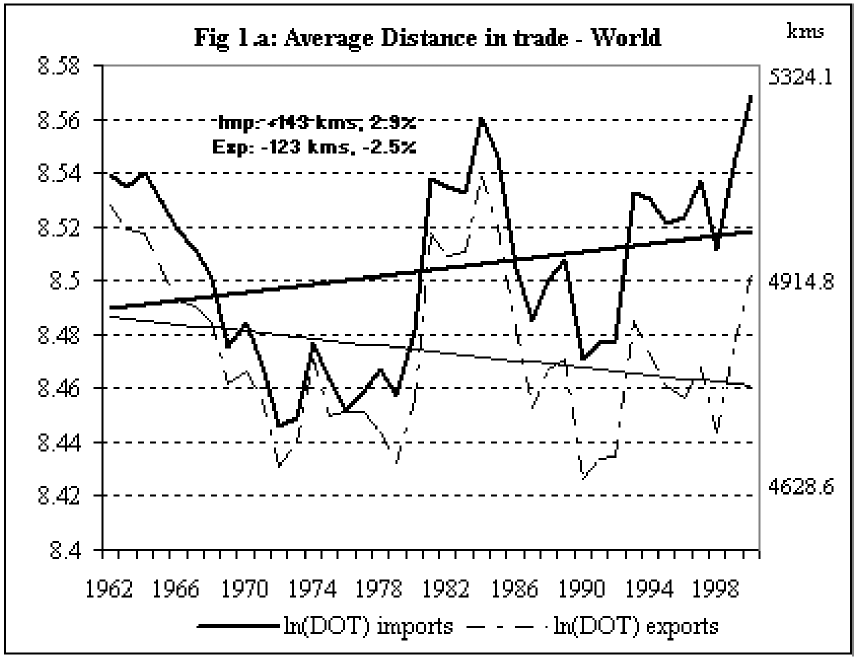


Fig 1.a: Average Distance in trade - World
kms
Imp: +143 kms, 2.9%
Exp: -123 kms, -2.5%
8.58
8.56
8.54
8.52
8.5
8.48
8.46
8.44
8.42
8.4
5324.1
4914.8
4628.6
1962 1966 1970 1974 1978 1982 1986 1990 1994 1998
ln(DOT) imports
ln(DOT) exports

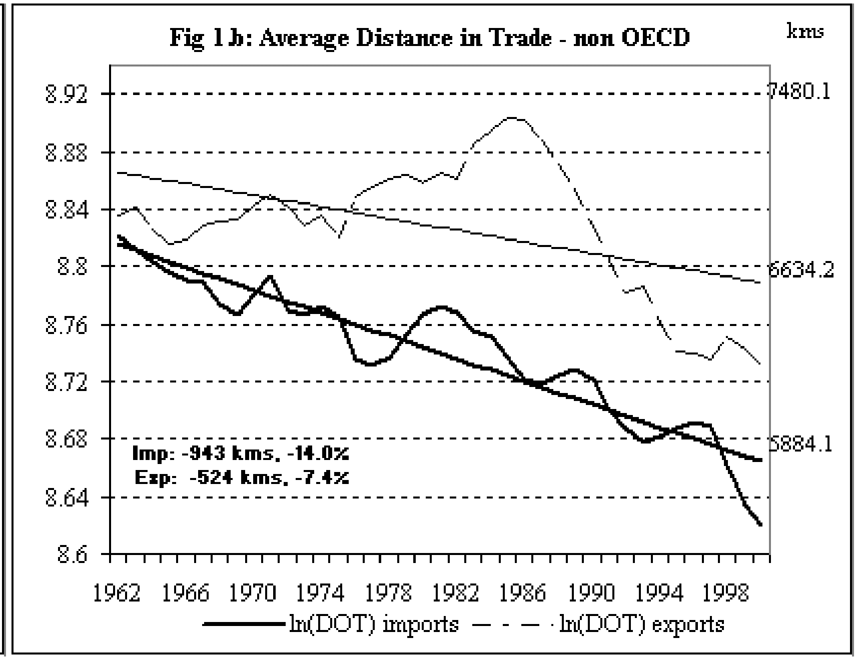


Fig 1.b: Average Distance in Trade - non OECD
kms
8.92
8.88
8.84
8.8
8.76
8.72
8.68
8.64
8.6
7480.1
6634.2
5884.1
Imp: -943 kms, -14.0%
Exp: -524 kms, -7.4%
1962 1966 1970 1974 1978 1982 1986 1990 1994 1998
ln(DOT) imports
ln(DOT) exports

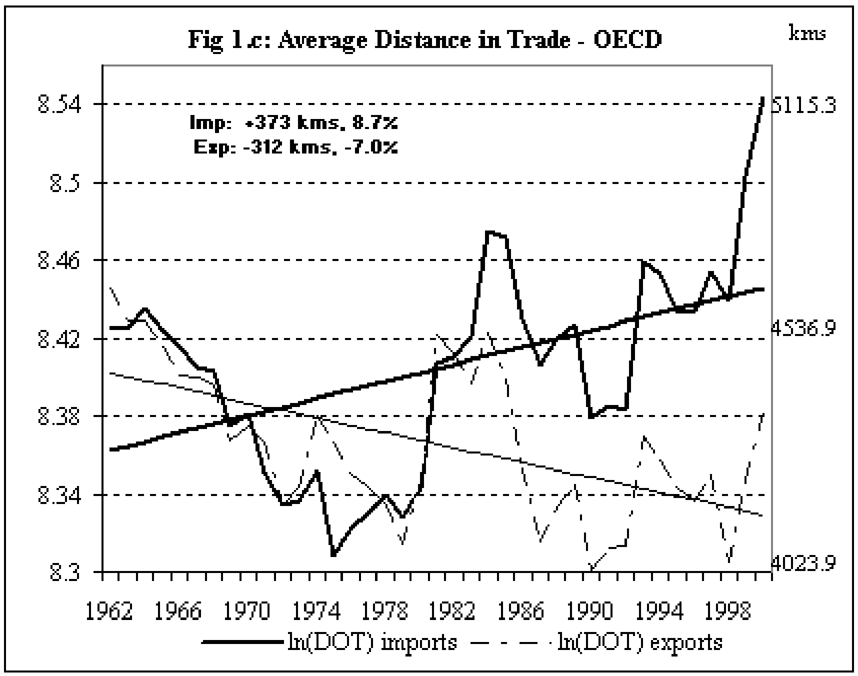


Fig 1.c: Average Distance in Trade - OECD
kms
Imp: +373 kms, 8.7%
Exp: -312 kms, -7.0%
8.54
8.5
8.46
8.42
8.38
8.34
8.3
5115.3
4536.9
4023.9
1962 1966 1970 1974 1978 1982 1986 1990 1994 1998
ln(DOT) imports
ln(DOT) exports

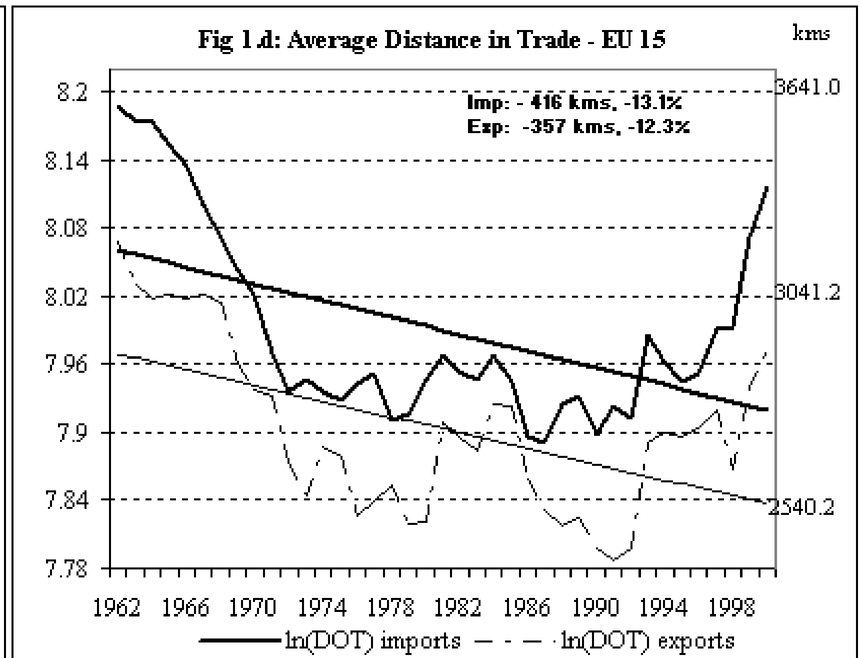


Fig 1.d: Average Distance in Trade - EU 15
kms
Imp: - 416 kms, -13.1%
Exp: -357 kms, -12.3%
8.2
8.14
8.08
8.02
7.96
7.9
7.84
7.78
3641.0
3041.2
2540.2
1962 1966 1970 1974 1978 1982 1986 1990 1994 1998
ln(DOT) imports
ln(DOT) exports

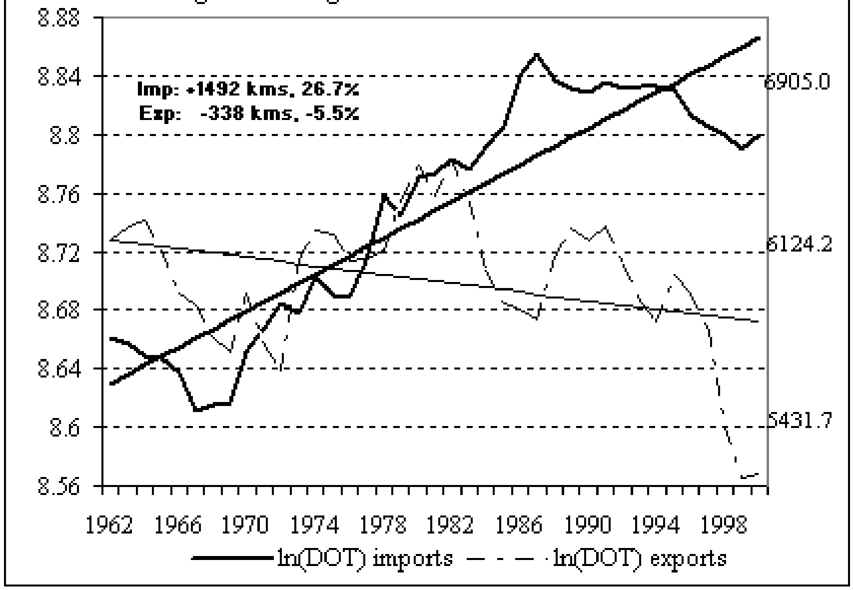


Fig 2.a: Average Distance in Trade - Americas

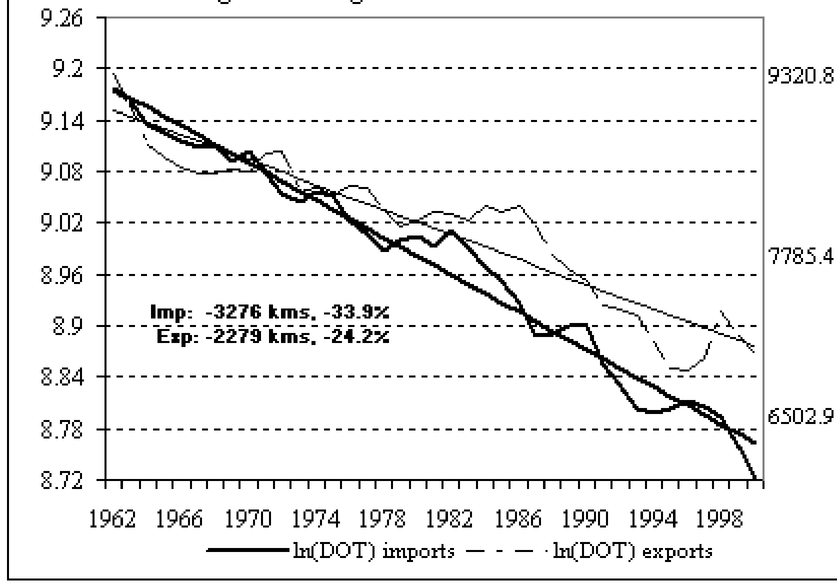


Fig 2.b: Average Distance in Trade - ASIA

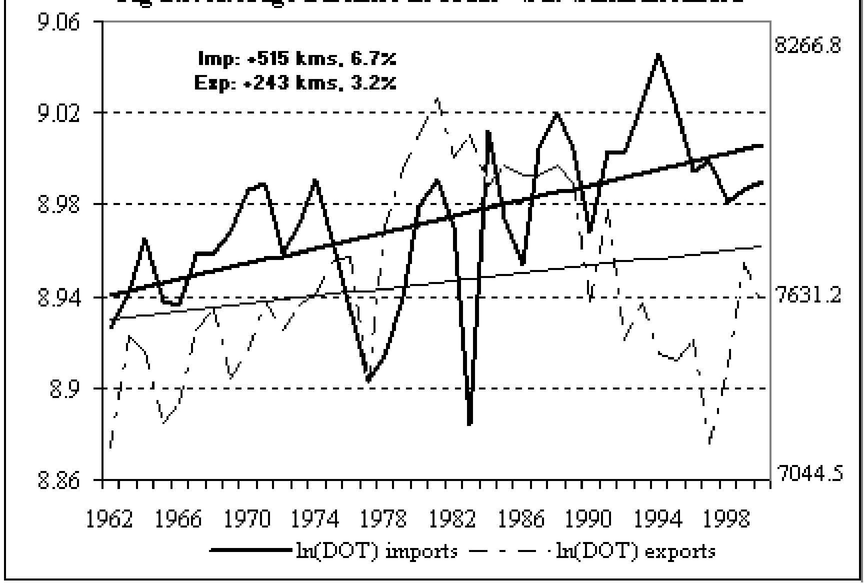


Fig 2.c: Average Distance in Trade - Sub-Saharan Africa

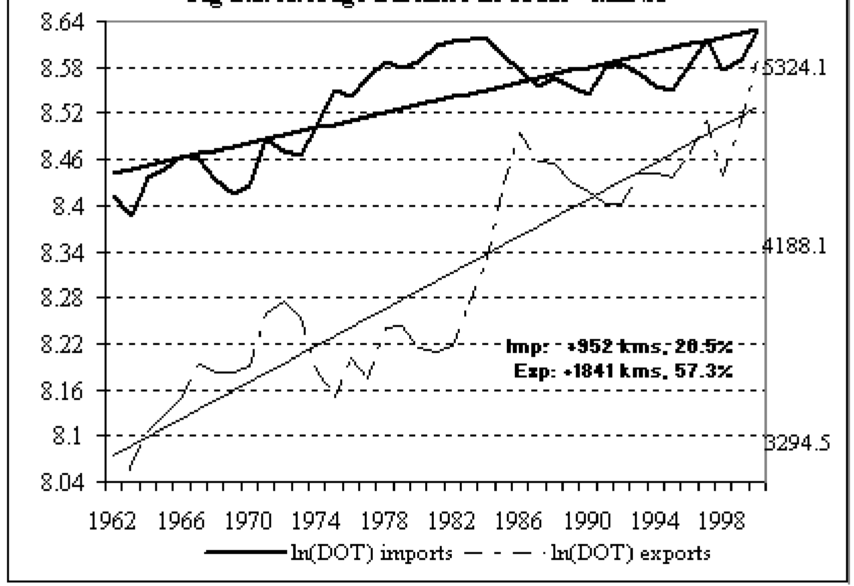


Fig 2.d: Average Distance in Trade - MENA

Fig 3.a: Average Distance in Trade - World w/o USA

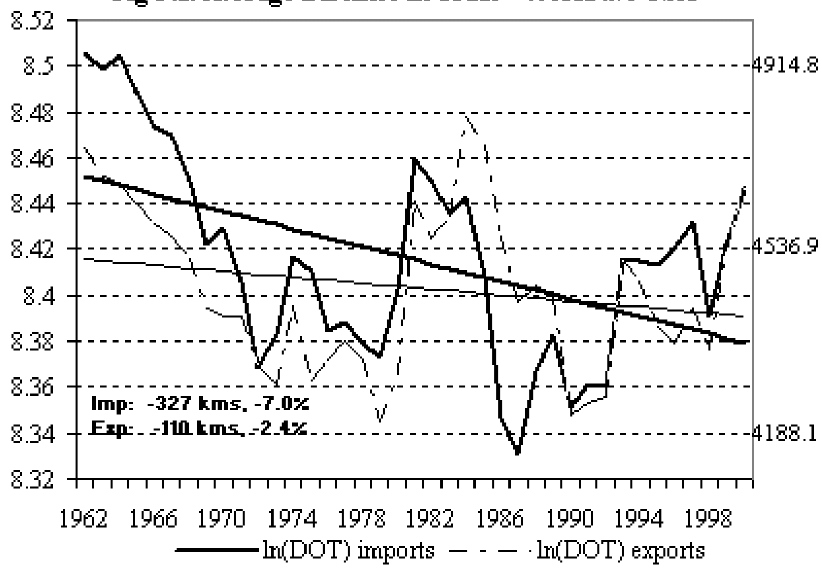


Fig 3.b: Average Distance in Trade - Americas w/o USA

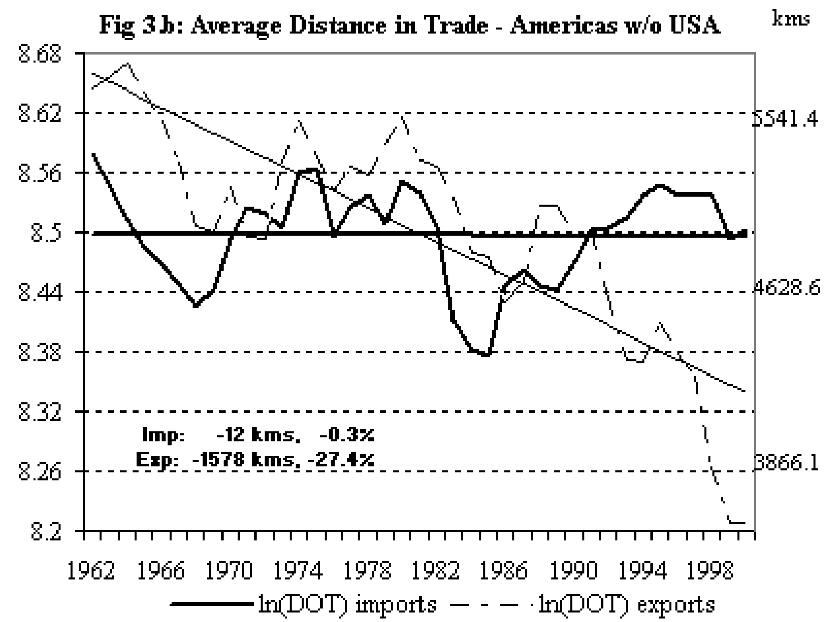


Fig 3.c: Average Distance in Trade - Latin America and Caribbean

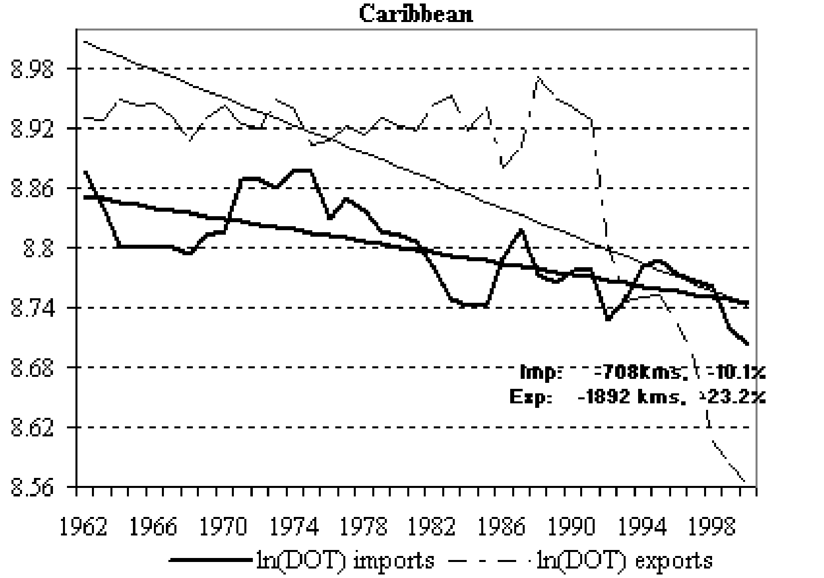
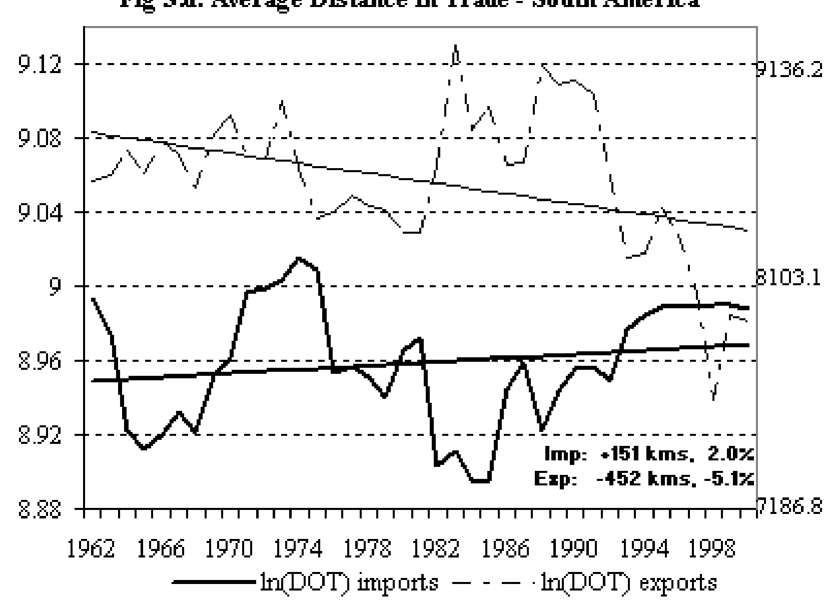


Fig 3.d: Average Distance in Trade - South America



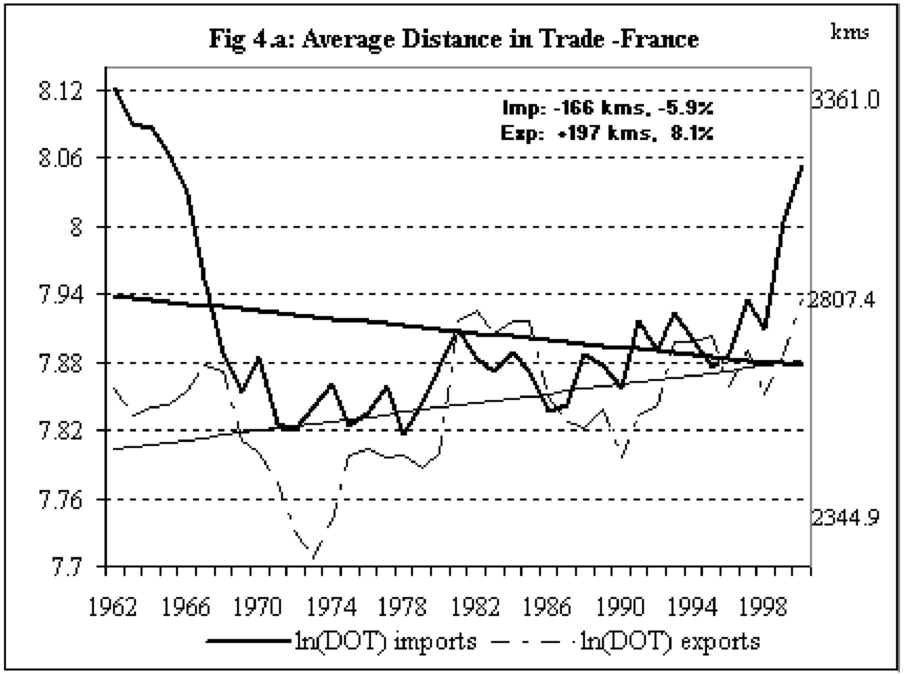


Fig 4.a: Average Distance in Trade -France

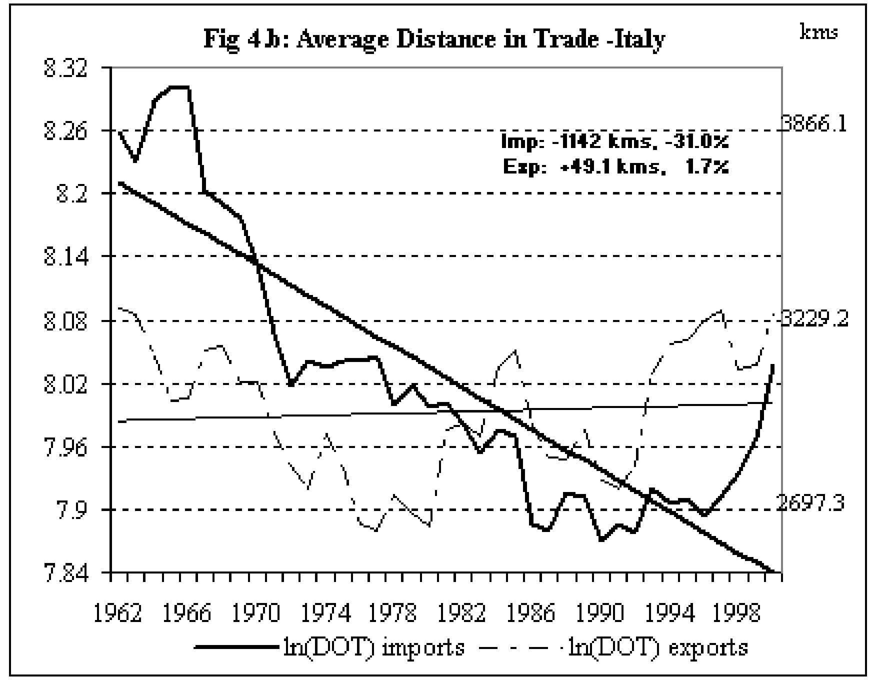


Fig 4.b: Average Distance in Trade -Italy

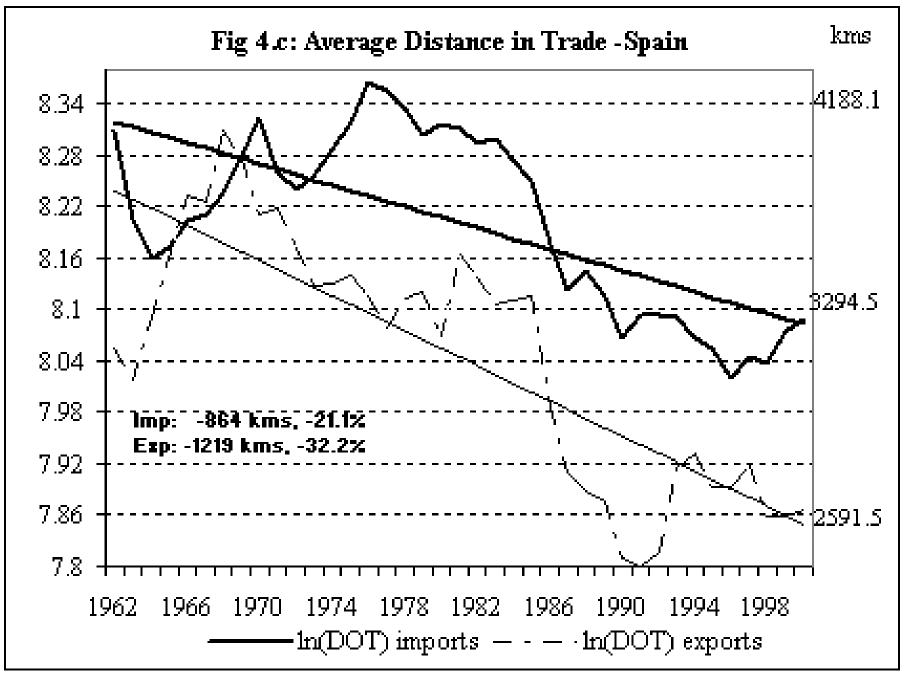


Fig 4.c: Average Distance in Trade -Spain

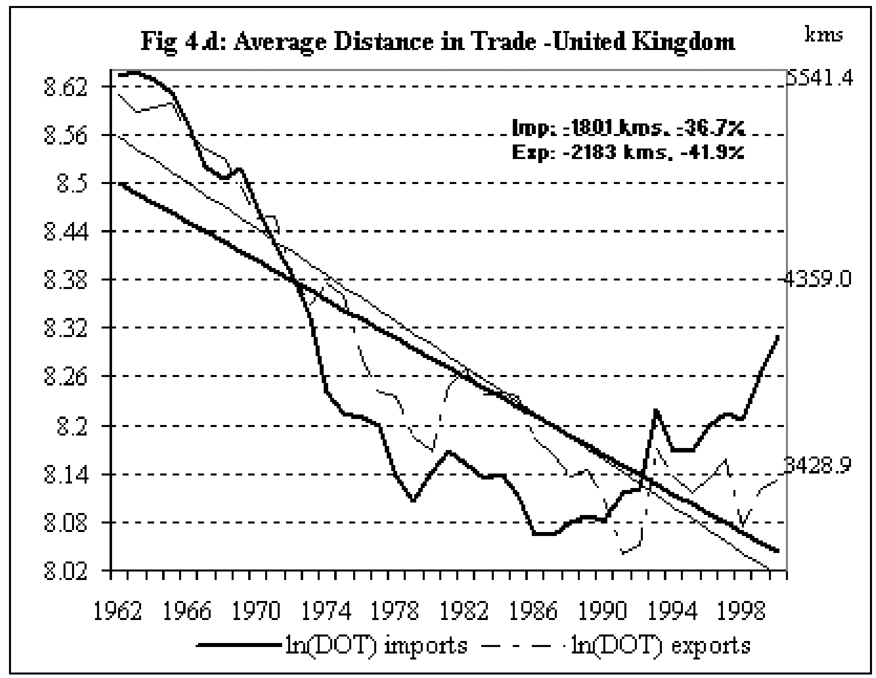


Fig 4.d: Average Distance in Trade -United Kingdom

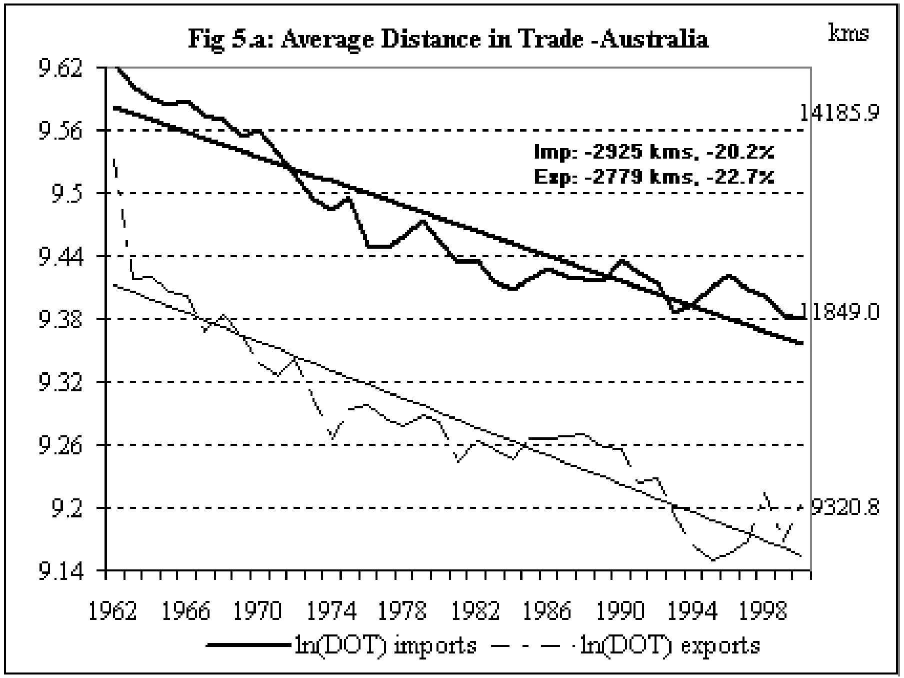


Fig 5.a: Average Distance in Trade -Australia

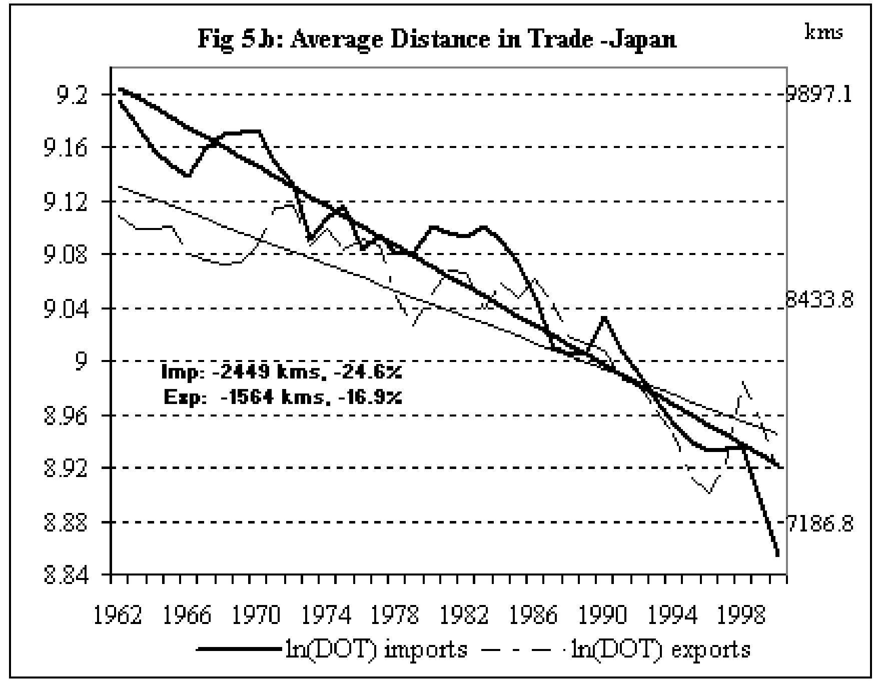


Fig 5.b: Average Distance in Trade -Japan

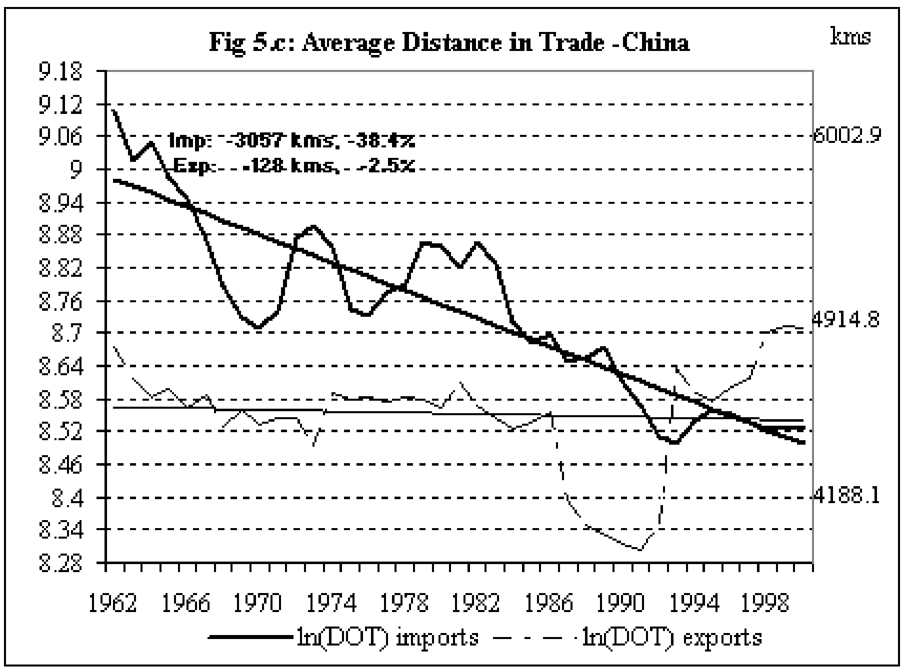


Fig 5.c: Average Distance in Trade -China

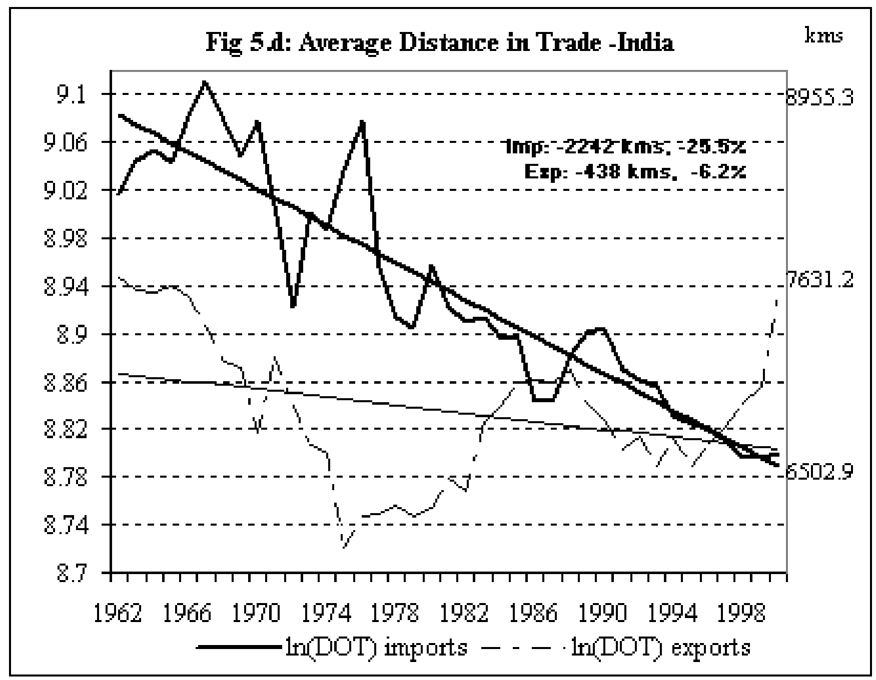


Fig 5.d: Average Distance in Trade -India

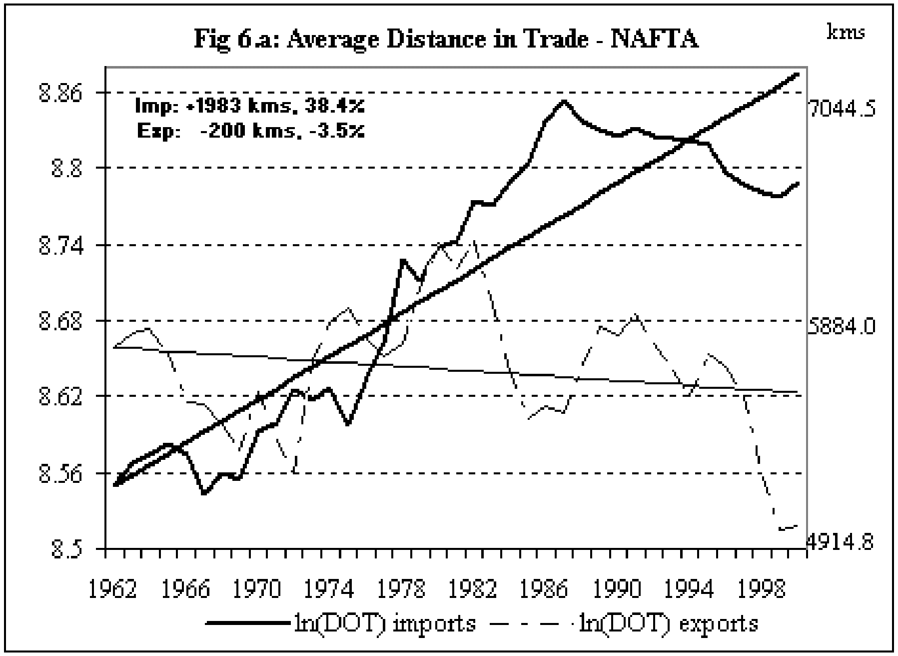


Fig 6.a: Average Distance in Trade - NAFTA
kms
Imp: +1983 kms, 38.4%
Exp: -200 kms, -3.5%
8.86
8.8
8.74
8.68
8.62
8.56
8.5
7044.5
5884.0
4914.8
1962 1966 1970 1974 1978 1982 1986 1990 1994 1998
ln(DOT) imports
ln(DOT) exports

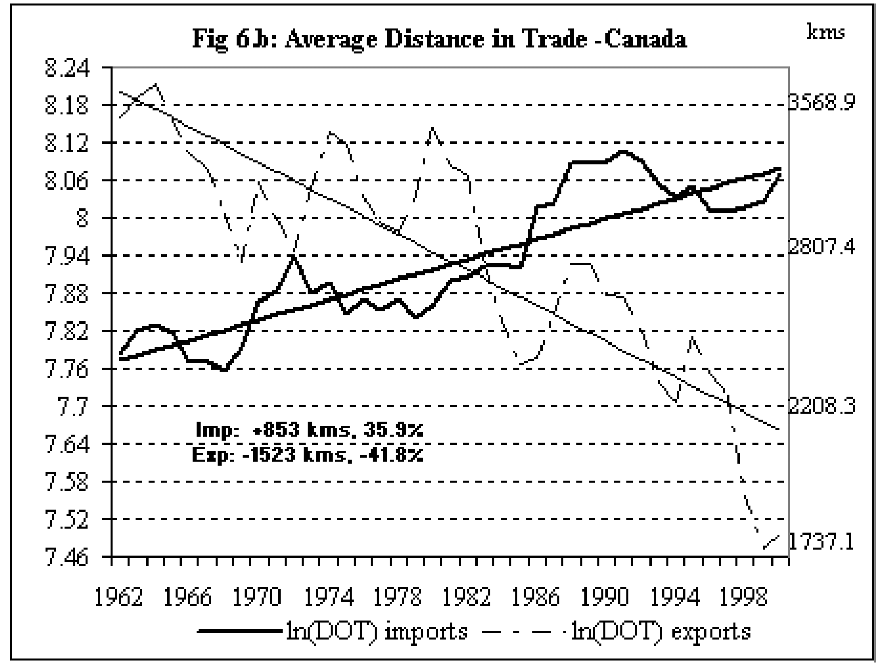


Fig 6.b: Average Distance in Trade -Canada
kms
8.24
8.18
8.12
8.06
8
7.94
7.88
7.82
7.76
7.7
7.64
7.58
7.52
7.46
3568.9
2807.4
2208.3
1737.1
Imp: +853 kms, 35.9%
Exp: -1523 kms, -41.8%
1962 1966 1970 1974 1978 1982 1986 1990 1994 1998
ln(DOT) imports
ln(DOT) exports

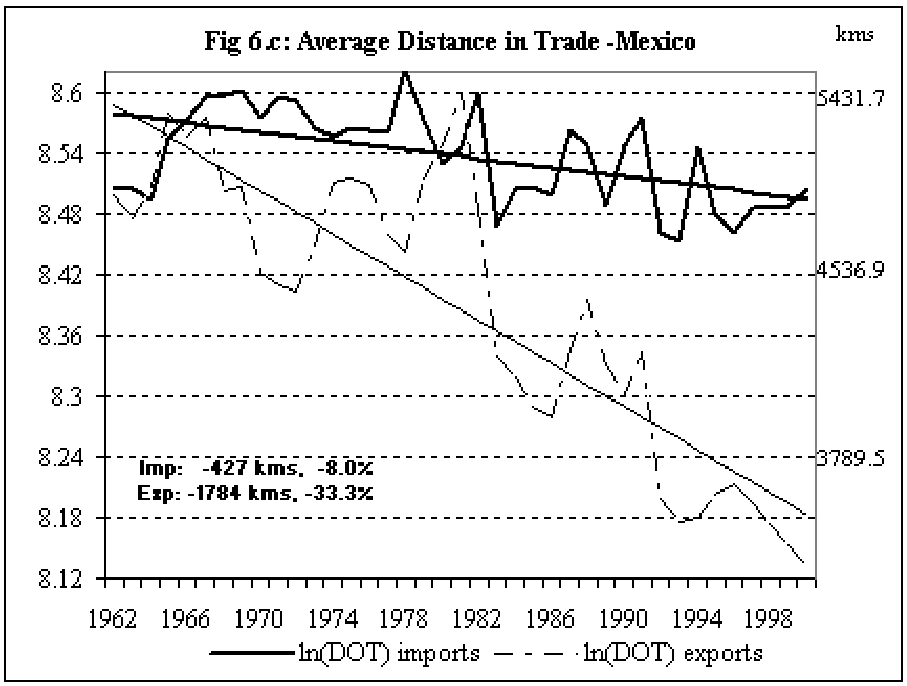


Fig 6.c: Average Distance in Trade -Mexico
kms
8.6
8.54
8.48
8.42
8.36
8.3
8.24
8.18
8.12
5431.7
4536.9
3789.5
Imp: -427 kms, -8.0%
Exp: -1784 kms, -33.3%
1962 1966 1970 1974 1978 1982 1986 1990 1994 1998
ln(DOT) imports
ln(DOT) exports

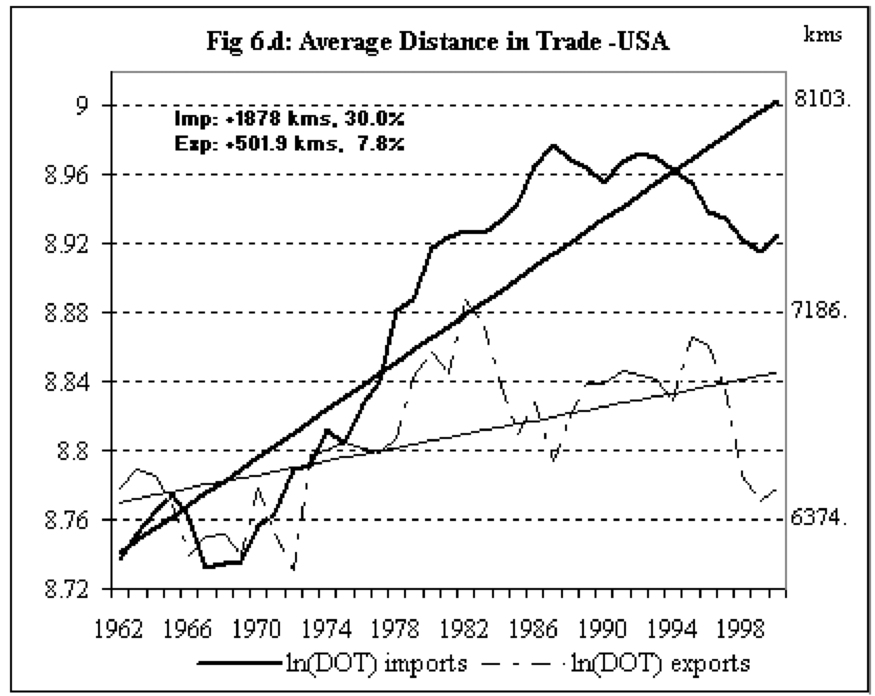


Fig 6.d: Average Distance in Trade -USA
kms
9
8.96
8.92
8.88
8.84
8.8
8.76
8.72
8103.
7186.
6374.
Imp: +1878 kms, 30.0%
Exp: +501.9 kms, 7.8%
1962 1966 1970 1974 1978 1982 1986 1990 1994 1998
ln(DOT) imports
ln(DOT) exports

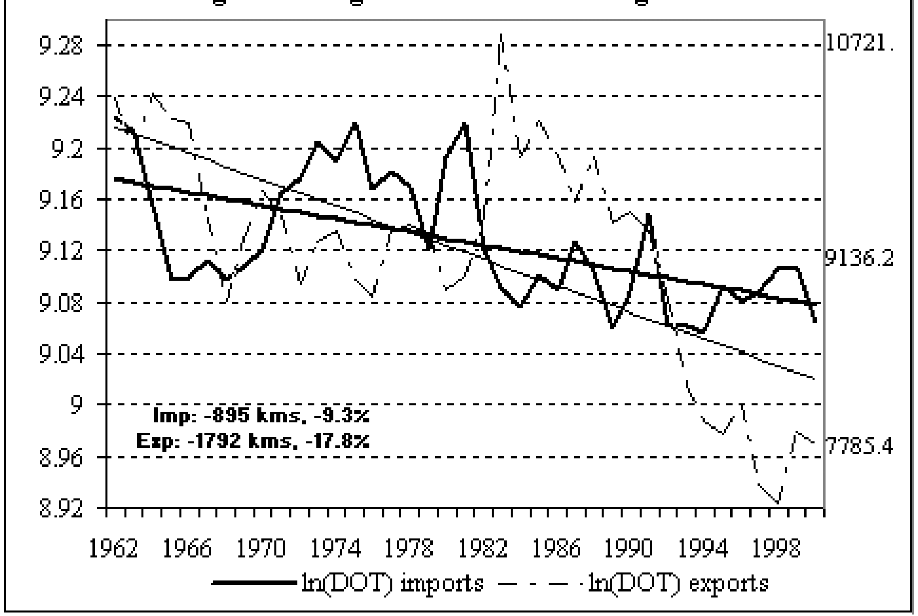


Fig 7.a: Average Distance in Trade -Argentina

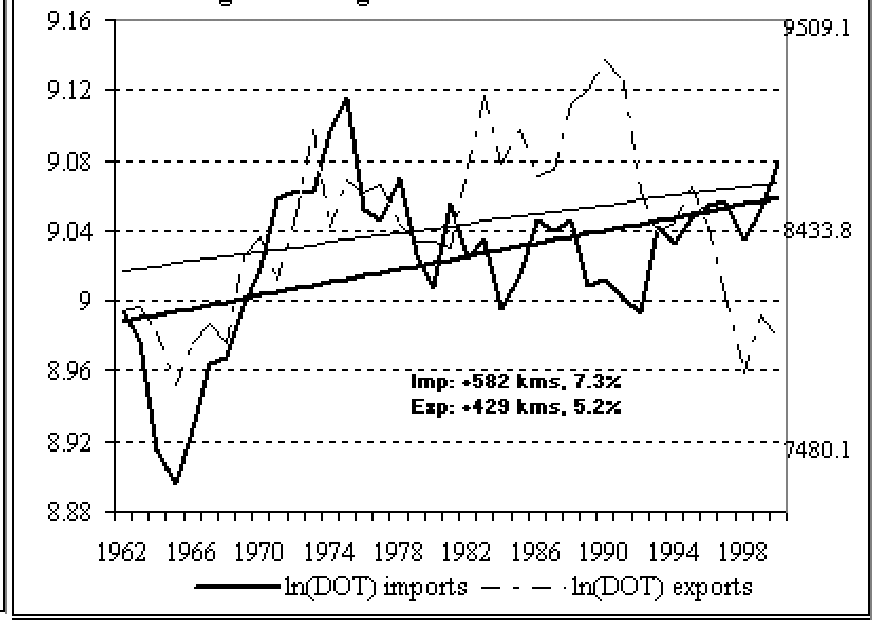


Fig 7.b: Average Distance in Trade -Brazil

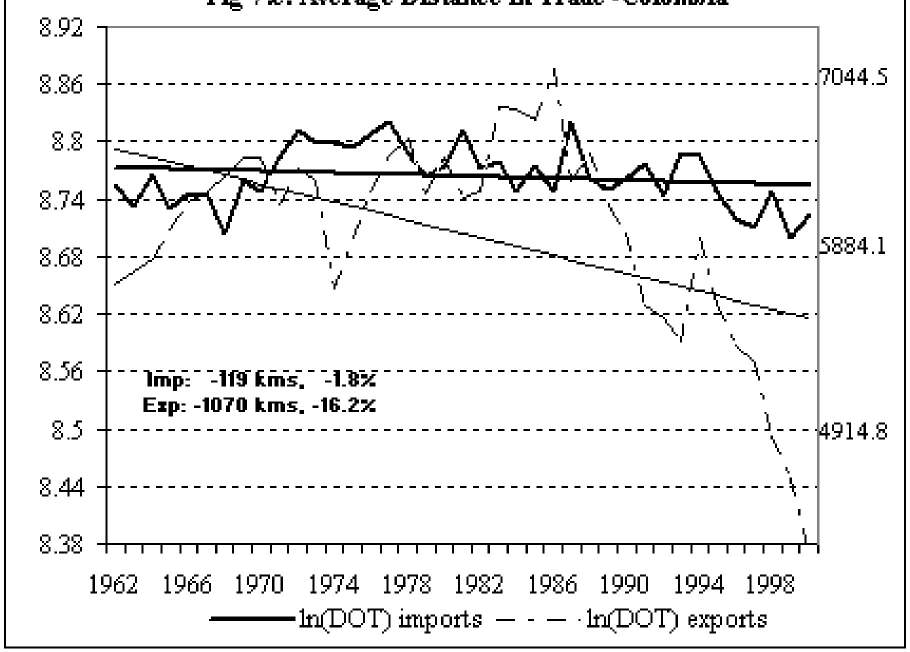


Fig 7.c: Average Distance in Trade -Colombia

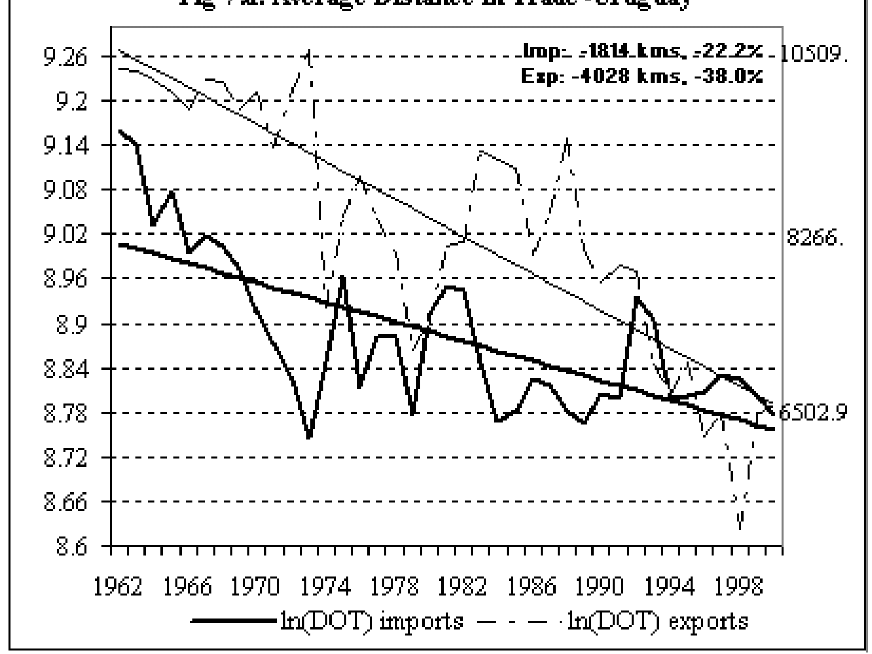


Fig 7.d: Average Distance in Trade -Uruguay

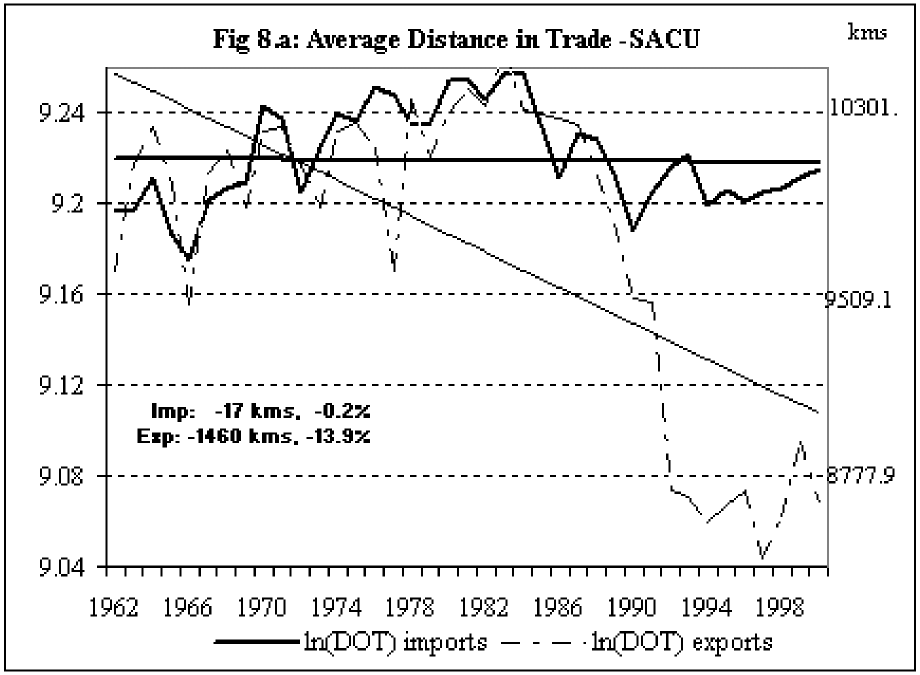


Fig 8.a: Average Distance in Trade -SACU

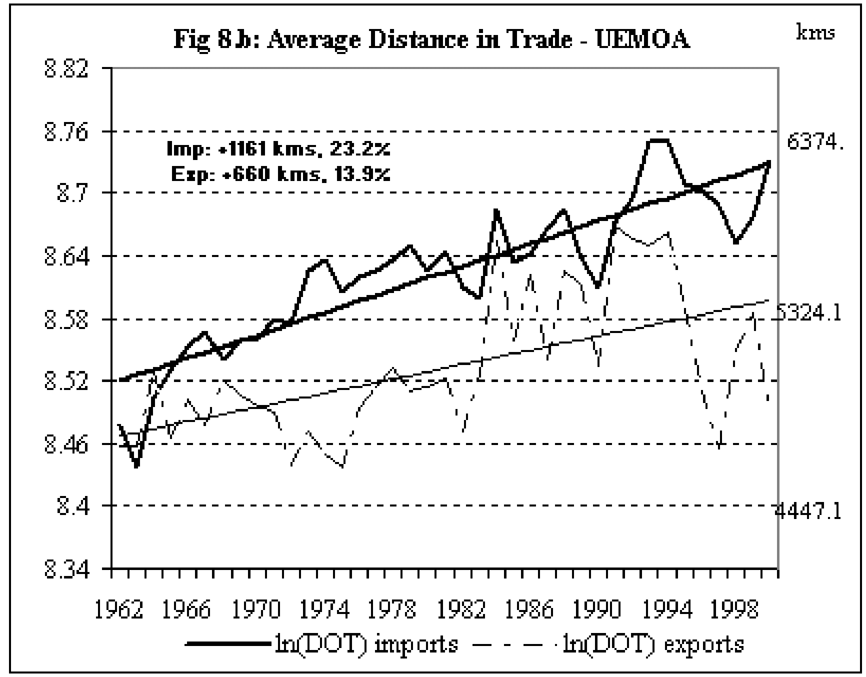


Fig 8.b: Average Distance in Trade - UEMOA

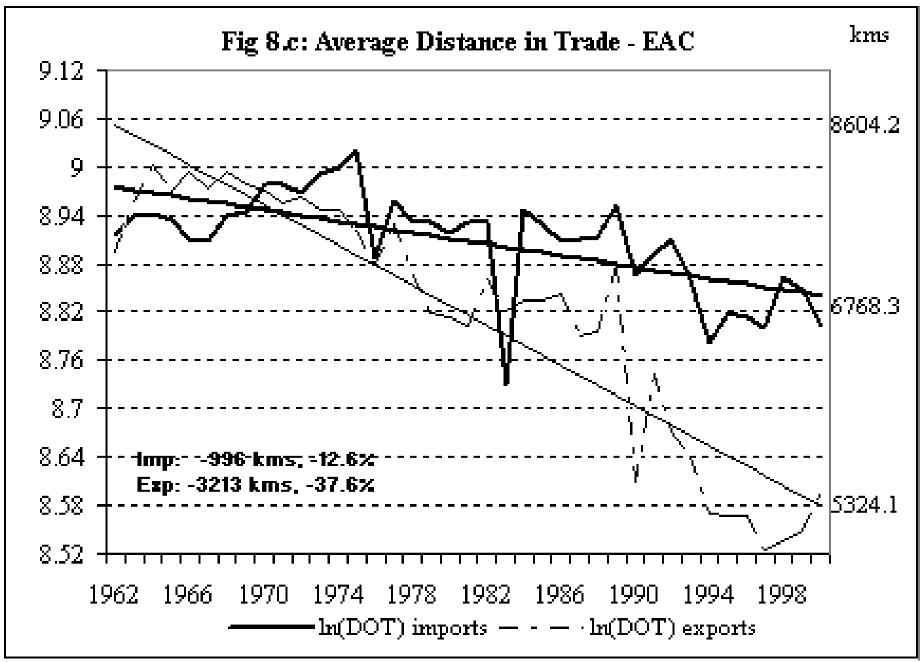


Fig 8.c: Average Distance in Trade - EAC

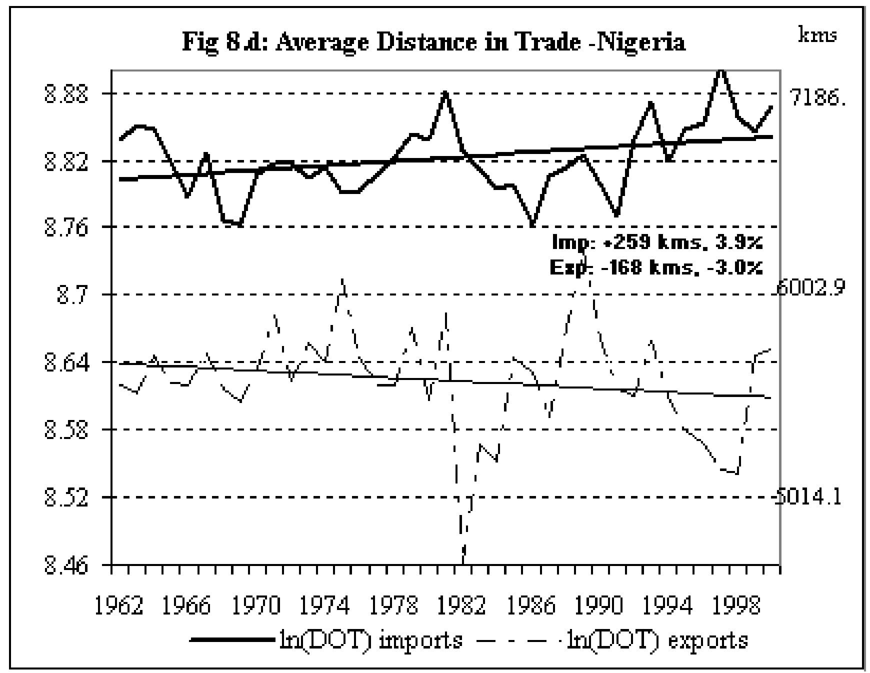


Fig 8.d: Average Distance in Trade -Nigeria

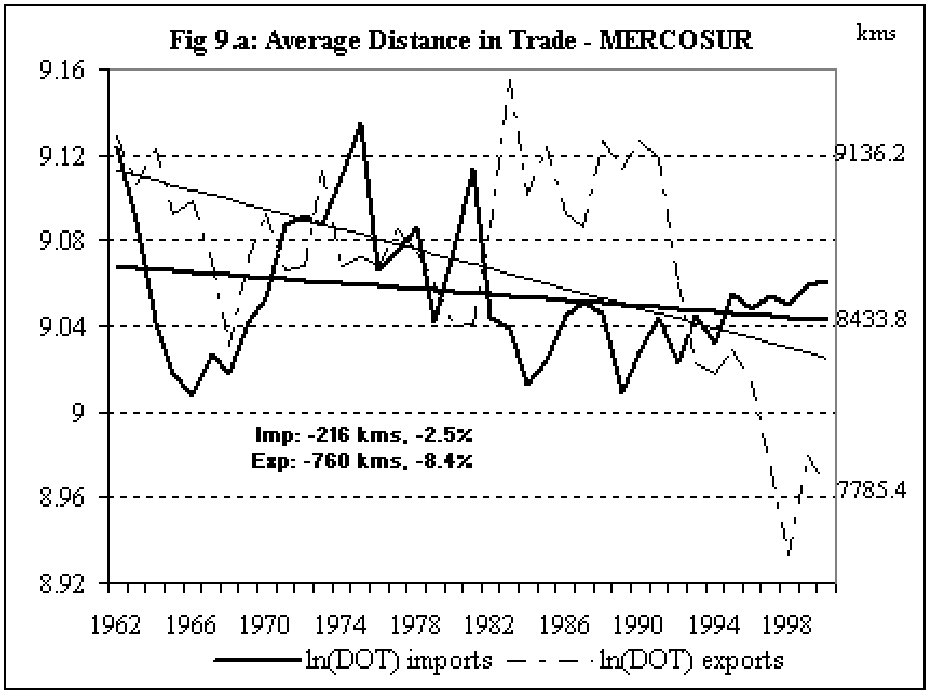


Fig 9.a: Average Distance in Trade - MERCOSUR

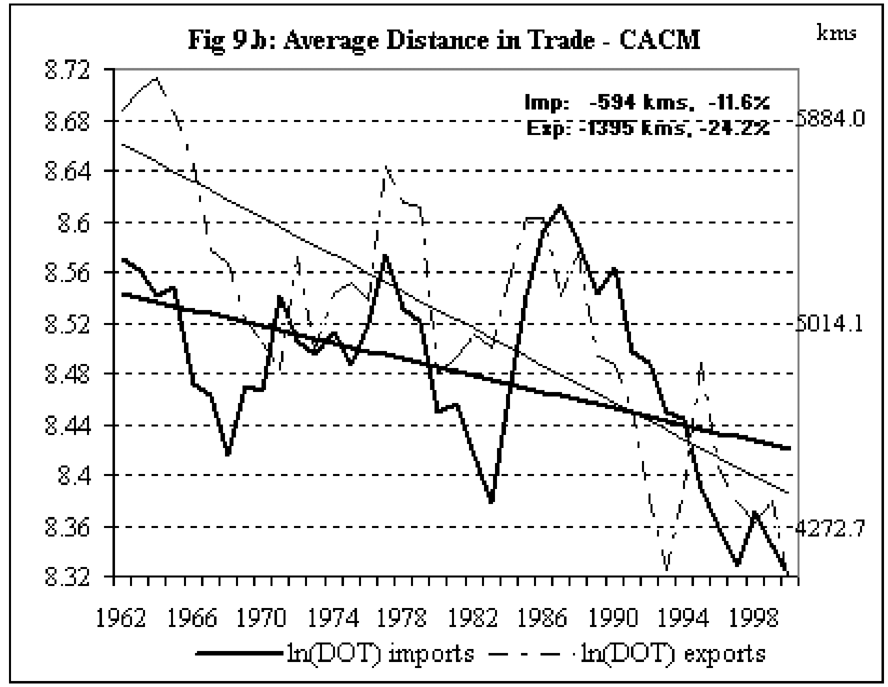


Fig 9.b: Average Distance in Trade - CACM

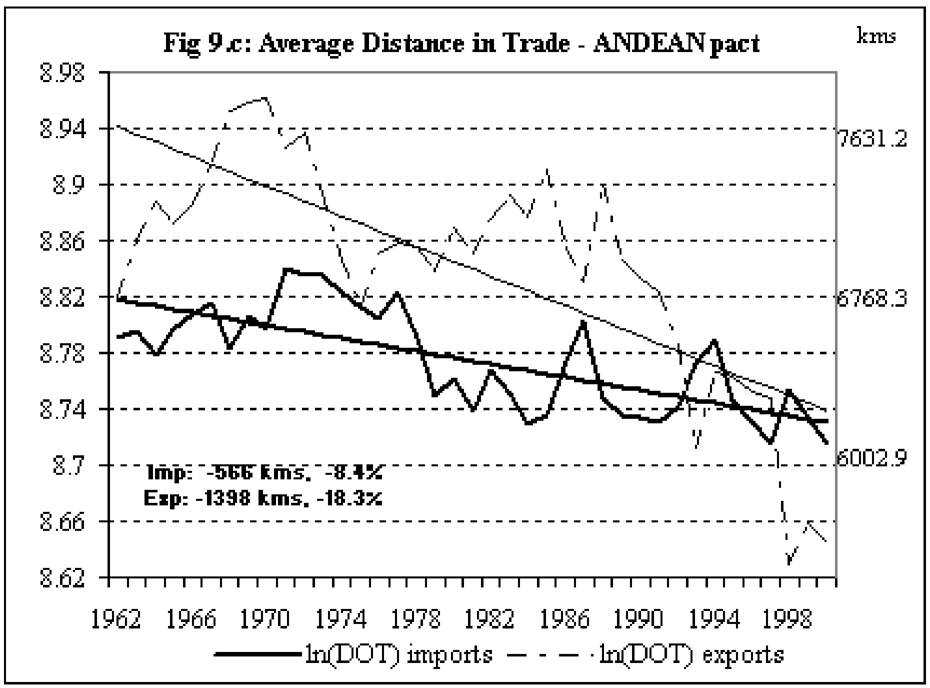


Fig 9.c: Average Distance in Trade - ANDEAN pact

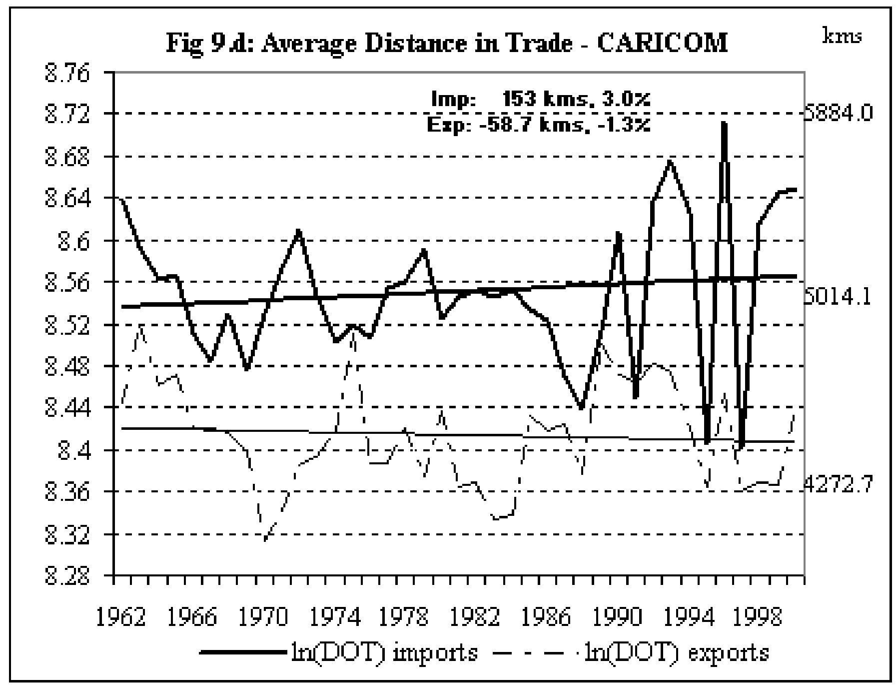


Fig 9.d: Average Distance in Trade - CARICOM

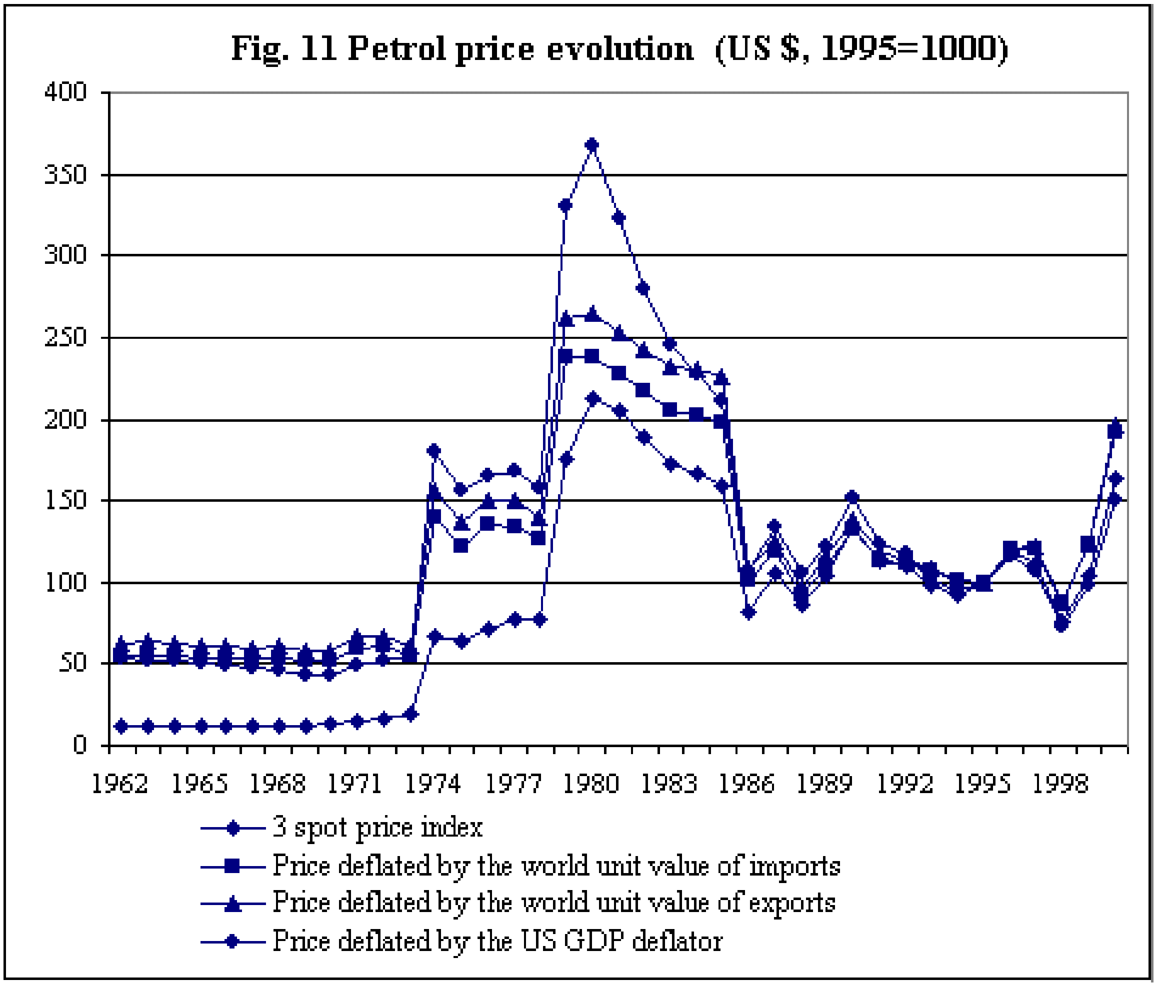


Fig. 11 Petrol price evolution (US $, 1995=1000)
400
350
300
250
200
150
100
50
0
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
3 spot price index
Price deflated by the world unit value of imports
Price deflated by the world unit value of exports
Price deflated by the US GDP deflator

Appendix 1. Data, Sample and Computations

This study is based on non-fuel trade data reported from 1962 to 2000 by 150 countries[60] to the database COMTRADE of the United Nations Statistical Division. The list of the available countries are reported in Table A.1. These reporting countries account together for more than 90% of world trade. The distance of trade (DOT) is computed per country and per year with these trade data and the spherical distance between the main economic cities of any pair of countries. The source for the location of capitals is the CIA World Factbook. The calculations of the spherical distances are our own.

We report the number of data per country in Table A.1 and per year in Table A.2 for the distance of imports ("Imports w/o") and of exports ("Exports w/o). These tables reveal some variation in the list of available countries per years, but this is essentially due to small countries (in terms of share in the world trade).[61] Hence, this variation in the number of countries does not reflect a corresponding variation in the trade weights and then does not influence the evolution of the world average distance. However this variation may affect significantly i) the trend of the DOT of some sub-region such as Sub-Saharan Africa; and ii) the trend of the DOT of the average country in the world, as in this case all the countries have the same weight.

To overcome this problem, when a country's import data is not available, *mirror estimates*, i.e. export data reported by the partner countries, are used (and *vice versa*). This approach has the advantage of covering almost all the missing data[62]. Once the DOT per country and year is computed using the database with mirror estimates, we have 5,777 observations,[63]rather than 4,641 for imports and 4,670 for exports in the data base without mirror estimates (see Table A.1 and A.2).

[60] Actually the sample covers more than 150 countries as data concerning Belgium -Luxembourg and SACU (Southern African Customs Union) is not presented for each individual country.
[61] An exception is China, which reports data only since 1984.
[62] Mirror statistics also have some shortcomings, especially for trade between developing countries.
[63] Potential number=150*39=5850.

Table A.1: Countries in the sample and available DOT data in 1962-2000

[w/o (w.): number of observations in the sample without (with) mirror estimates]

Region/Country	Imports		Exports		Region/Country	Imports		Exports	
	w/o	w.	w/o	w.		w/o	w.	w/o	w.
Sub-Saharan Africa	**995**	**1463**	**1004**	**1462**	**Asia**	**974**	**1216**	**995**	**1221**
East and Southern Africa	**497**	**724**	**504**	**723**	**East Asia and Pacific**	**813**	**1031**	**831**	**1036**
Angola	16	39	22	39	Australia	38	39	38	39
Burundi	23	39	23	39	Brunei	35	39	35	39
Comoros	19	39	19	39	China	15	39	15	39
Kenya	34	39	38	39	Fiji	33	39	34	39
Madagascar	35	39	35	39	Hong Kong	39	39	39	39
Mozambique	24	39	25	39	Indonesia	37	39	39	39
Mauritius	39	39	39	39	Japan	39	39	39	39
Malawi	31	36	28	36	Kiribati	30	32	29	32
Reunion	34	34	34	34	South Korea	39	39	39	39
Rwanda	20	39	20	39	Lao PDR	15	39	15	39
Sudan	31	39	30	39	Macao	32	39	33	39
Somalia	22	39	22	39	Myanmar	23	39	22	39
Seychelles	28	39	28	38	Malaysia	37	37	37	37
Tanzania	23	36	23	36	New Caledonia	23	39	28	39
Uganda	26	39	27	39	New Zealand	37	39	37	39
South Africa	31	39	30	39	Philippines	39	39	39	39
Zaire	23	39	21	39	Papua New Guinea	28	39	32	39
Zambia	20	36	21	36	French Polynesia	26	39	26	39
Zimbabwe	18	36	19	36	Singapore	39	39	39	39
West Africa	**498**	**739**	**500**	**739**	Solomon Islands	21	34	22	35
Benin	24	39	26	39	Thailand	39	39	39	39
Burkina Faso	24	39	24	39	Tonga	27	33	28	37
Central African Rep.	27	39	27	39	Taiwan	39	39	39	39
Cote d'Ivoire	29	39	29	39	Vietnam	16	37	16	37
Cameroon	31	39	31	39	Vanuatu	23	39	28	39
Congo	28	39	28	39	Samoa	23	39	23	39
Cape Verde	19	37	20	37	Afghanistan	21	39	21	39
Gabon	24	39	25	39	**South Asia**	**161**	**185**	**164**	**185**
Ghana	29	39	29	39	Bangladesh	24	29	25	29
Gambia	25	39	25	39	India	37	39	38	39
Liberia	23	39	23	39	Sri Lanka	34	39	34	39
Mali	27	39	26	39	Nepal	27	39	28	39
Mauritania	21	39	21	39	Pakistan	39	39	39	39
Niger	26	39	26	39	**Europe**	**847**	**883**	**849**	**889**
Nigeria	32	39	32	39	Austria	38	39	38	39
Senegal	35	39	35	39	Belgique-Lux	37	37	37	37
Sierra Leone	20	39	21	39	Switzerland	39	39	39	39
Chad	20	39	19	39	Cyprus	39	39	39	39
Togo	34	39	33	39	Germany	39	39	39	39
Americas	**1209**	**1435**	**1234**	**1425**	Denmark	39	39	39	39
Netherlands Antilles	32	39	32	39	Spain	39	39	39	39
Argentina	39	39	39	39	Finland	38	39	38	39
Antigua and Barbuda	15	39	14	37	France	39	39	39	39
Bahamas	23	39	29	39	Faeroe Islands	25	32	26	37
Belize	32	39	32	39	United Kingdom	39	39	39	39
Bermuda	23	39	24	39	Greece	39	39	39	39
Bolivia	38	39	39	39	Greenland	27	34	28	35
Brazil	39	39	39	39	Hungary	37	39	37	39

Region/Country	Imports w/o	Imports w.	Exports w/o	Exports w.
Barbados	39	39	39	39
Canada	39	39	39	39
Chile	39	39	39	39
Colombia	39	39	39	39
Costa Rica	39	39	39	39
Cuba	17	39	22	39
Dominica	28	38	26	38
Dominican Republic	23	39	32	39
Ecuador	39	39	39	39
Grenada	26	37	25	36
Guatemala	39	39	39	39
Guyana	22	39	22	39
Honduras	39	39	39	39
Haiti	17	39	27	39
Jamaica	39	39	39	39
St. Lucia	31	37	31	36
Mexico	39	39	39	39
Montserrat	15	37	12	33
Nicaragua	38	39	38	39
Panama	39	39	39	39
Peru	39	39	39	39
Paraguay	39	39	39	39
El Salvador	39	39	39	39
Suriname	32	39	31	39
Trinidad and Tobago	36	39	36	39
Uruguay	39	39	39	39
United States	39	39	39	39
St. Vincent and the Gre.	20	38	21	36
Venezuela, RB	39	39	39	39

Region/Country	Imports w/o	Imports w.	Exports w/o	Exports w.
Ireland	39	39	39	39
Iceland	39	39	39	39
Italy	39	39	39	39
Netherlands	39	39	39	39
Norway	39	39	39	39
Poland	21	39	21	39
Portugal	39	39	39	39
Sweden	39	39	39	39
Turkey	39	39	39	39
Middle East and North Africa	**616**	**780**	**588**	**780**
Midle East	**378**	**507**	**356**	**507**
United Arab Emirates	23	39	19	39
Bahrain	29	39	29	39
Iran	24	39	25	39
Iraq	22	39	21	39
Israel	39	39	39	39
Jordan	38	39	38	39
Kuwait	37	39	37	39
Lebanon	19	39	18	39
Oman	31	39	29	39
Qatar	25	39	18	39
Saudi Arabia	38	39	31	39
Syria	35	39	35	39
Yemen	18	39	17	39
North Africa	**238**	**273**	**232**	**273**
Djibouti	17	39	12	39
Algeria	37	39	38	39
Egypt	38	39	38	39
Libya	31	39	29	39
Morocco	39	39	39	39
Malta	37	39	37	39
Tunisia	39	39	39	39
World	**4641**	**5777** +24.5%	**4670**	**5777** +23.7%

Table A.2 Number of countries with available DOT data per year.

[w/o (w.): number of observations in the sample without (with) mirror estimates]

	1962	**1963**	**1964**	**1965**	**1966**	**1967**	**1968**	**1969**	**1970**	**1971**	**1972**	**1973**	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**	**1980**
Imports w/o	*102*	*106*	*114*	*119*	*117*	*121*	*127*	*130*	*140*	*139*	*142*	*141*	*142*	*139*	*134*	*132*	*124*	*145*	*146*
Imports w.	134	136	139	143	144	146	148	147	149	149	150	150	149	150	150	150	150	150	150
Exports w/o	*110*	*113*	*118*	*122*	*117*	*124*	*137*	*134*	*139*	*139*	*136*	*137*	*142*	*141*	*135*	*129*	*127*	*146*	*143*
Exports w.	136	134	136	145	147	145	148	147	149	149	150	150	149	150	150	150	150	150	150

	1981	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Imports w/o	*148*	*147*	*148*	*106*	*105*	*102*	*99*	*99*	*100*	*103*	*102*	*99*	*100*	*101*	*113*	*109*	*108*	*104*	*99*	*89*
Imports w.	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	149	149	149	148	148
Exports w/o	*146*	*146*	*143*	*102*	*98*	*100*	*99*	*99*	*100*	*105*	*106*	*102*	*106*	*106*	*113*	*109*	*108*	*103*	*99*	*91*
Exports w.	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	149	149	149	148	148

Table A.3: Trend (in percentage) in the Distance [a)] of:

Country/Region	Exports		Imports		Total Trade	
	Coeff	p-value	Coeff	p-value	Coeff	p-value
1. World	**-0.07**	**0.08**	**0.08**	**0.12**	**0.01**	**0.85**
World w/o USA	*-0.07*	*0.16*	*-0.19*	*0.00*	*-0.13*	*0.02*
World w/o EU-15	*-0.14*	*0.01*	*0.01*	*0.84*	*-0.06*	*0.09*
1.1 OECD countries (2000)	-0.19	0.00	0.22	0.00	0.02	0.73
1.2 non-OECD countries (2000)	-0.20	0.00	-0.40	0.00	-0.30	0.00
2. Europe	**-0.32**	**0.00**	**-0.32**	**0.02**	**-0.33**	**0.01**
2.1 EU- 15 members	-0.35	0.00	-0.37	0.01	-0.36	0.01
- EU- 12 members	-0.41	0.00	-0.42	0.01	-0.42	0.00
- EU- 9 members	-0.37	0.00	-0.40	0.03	-0.39	0.01
- EU- 6 members	0.09	0.35	-0.10	0.50	-0.01	0.91
France	*0.20*	*0.00*	*-0.16*	*0.30*	*0.02*	*0.88*
Germany	*-0.06*	*0.52*	*-0.08*	*0.41*	*-0.07*	*0.40*
Italy	*0.04*	*0.66*	*-0.98*	*0.00*	*-0.46*	*0.00*
Spain	*-1.02*	*0.00*	*-0.62*	*0.00*	*-0.82*	*0.00*
United Kingdom	*-1.43*	*0.00*	*-1.20*	*0.00*	*-1.30*	*0.00*
2.2 Others *c)*	-0.03	0.51	0.23	0.00	0.12	0.01
3. Americas	**-0.15**	**0.05**	**0.62**	**0.00**	**0.28**	**0.00**
Americas w/o CAN and USA	*-0.69*	*0.00*	*-0.28*	*0.00*	*-0.46*	*0.00*
3. 1 NAFTA	-0.09	0.23	0.86	0.00	0.44	0.00
Canada	*-1.42*	*0.00*	*0.83*	*0.00*	*-0.30*	*0.00*
Mexico	*-1.06*	*0.00*	*-0.22*	*0.00*	*-0.58*	*0.00*
United States	*0.20*	*0.00*	*0.69*	*0.00*	*0.49*	*0.00*
3.2 MERCOSUR	-0.23	0.00	-0.07	0.15	-0.14	0.00
Argentina	*-0.52*	*0.00*	*-0.26*	*0.00*	*-0.37*	*0.00*
Brazil	*0.13*	*0.10*	*0.18*	*0.00*	*0.17*	*0.01*
Paraguay	*-0.75*	*0.00*	*0.17*	*0.28*	*0.01*	*0.88*
Uruguay	*-1.26*	*0.00*	*-0.66*	*0.00*	*-0.97*	*0.00*
3.3 CARICOM	-0.03	0.64	0.08	0.64	0.06	0.54
3.4 ANDEAN Pact	-0.53	0.00	-0.23	0.00	-0.34	0.00
Bolivia	*-1.26*	*0.00*	*-0.56*	*0.00*	*-0.84*	*0.00*
Colombia	*-0.47*	*0.01*	*-0.05*	*0.31*	*-0.18*	*0.03*
Ecuador	*-0.29*	*0.02*	*-0.46*	*0.00*	*-0.36*	*0.00*
Peru	*0.19*	*0.03*	*-0.28*	*0.00*	*-0.07*	*0.08*
Venezuela, RB	*-0.08*	*0.78*	*-0.26*	*0.00*	*-0.32*	*0.00*
3.4 CACM	-0.73	0.00	-0.32	0.00	-0.52	0.00
4. Asia	**-0.73**	**0.00**	**-1.09**	**0.00**	**-0.90**	**0.00**
Asia w/o China	*-0.71*	*0.00*	*-1.03*	*0.00*	*-0.85*	*0.00*
4.1 East Asia and Pacific (EAP)	-0.81	0.00	-1.15	0.00	-0.97	0.00
- EAP w/o China	-0.80	0.00	-1.09	0.00	-0.93	0.00
Australia	*-0.68*	*0.00*	*-0.59*	*0.00*	*-0.56*	*0.00*
China	*-0.08*	*0.60*	*-1.28*	*0.00*	*-0.65*	*0.00*
Hong Kong, China	*-1.16*	*0.00*	*-1.44*	*0.00*	*-1.79*	*0.00*
Japan	*-0.49*	*0.00*	*-0.74*	*0.00*	*-0.61*	*0.00*
Korea, Rep.	*0.13*	*0.52*	*0.10*	*0.50*	*0.10*	*0.25*

Country/Region	Exports		Imports		Total Trade	
	Coeff	**p-value**	**Coeff**	**p-value**	**Coeff**	**p-value**
New Zealand	*-1.35*	*0.00*	*-0.70*	*0.00*	*-1.04*	*0.00*
Taiwan	*-0.05*	*0.84*	*-0.18*	*0.10*	*-0.13*	*0.38*
- Others EAP	-0.09	0.23	-0.39	0.00	-0.24	0.00
ASEAN	*0.02*	*0.84*	*-0.32*	*0.00*	*-0.17*	*0.01*
Others b)	*-0.76*	*0.00*	*-1.21*	*0.00*	*-0.96*	*0.00*
4.2 South Asia	0.10	0.93	-0.82	0.00	-0.39	0.00
- India	-0.26	0.20	-0.77	0.00	-0.52	0.00
- Others	0.55	0.00	-0.84	0.00	-0.18	0.02
Afghanistan	*0.01*	*0.99*	*-0.71*	*0.00*	*-0.40*	*0.05*
Bangladesh	*0.61*	*0.04*	*-1.94*	*0.00*	*-0.58*	*0.01*
Nepal	*2.43*	*0.00*	*0.47*	*0.00*	*1.17*	*0.07*
Pakistan	*0.18*	*0.20*	*-0.80*	*0.00*	*-0.43*	*0.00*
Sri Lanka	*0.86*	*0.00*	*-0.32*	*0.00*	*0.28*	*0.00*
5. Sub-Saharan Africa	**0.08**	**0.14**	**0.17**	**0.00**	**0.15**	**0.00**
5.1 East and Southern Africa (ESA)	-0.06	0.43	-0.01	0.80	-0.03	0.60
- SACU	-0.39	0.00	0.00	0.88	-0.17	0.00
- ESA w/o SACU	-0.06	0.33	-0.20	0.03	-0.16	0.04
SADC (w/o SACU)	0.22	*0.00*	*-0.29*	*0.01*	*-0.09*	*0.33*
EAC	*-1.24*	*0.00*	*-0.35*	*0.00*	*-0.67*	*0.24*
5.2 West Africa	0.62	0.00	0.17	0.00	0.53	0.00
- Nigeria	-0.14	0.05	0.10	0.09	0.31	0.00
- West Africa w/o Nigeria	0.19	0.00	0.88	0.00	0.28	0.00
UEMOA	*0.34*	*0.00*	0.55	*0.00*	0.47	*0.00*
CEMAC	*0.35*	*0.00*	0.30	*0.00*	0.33	*0.00*
6. Middle East and North Africa	**1.19**	**0.00**	**0.49**	**0.00**	**0.63**	**0.10**
6. 1 Middle East	1.03	0.00	0.34	0.00	0.44	0.00
- GCC	1.72	0.00	0.28	0.00	0.25	0.00
- Israel	1.02	0.00	-0.11	0.14	0.43	0.00
- Others *d)*	0.07	0.57	0.17	0.01	0.15	0.01
6.2 North Africa	0.20	0.03	0.36	0.00	0.36	0.00
- Egypt, Arab Rep.	-0.47	0.00	0.30	0.03	0.31	0.01
- Others *e)*	0.77	0.00	0.32	0.00	0.43	0.00

a) 100* $\hat{\beta}$, with $\hat{\beta}$ from $\ln(d_{it}^{Z}) = \alpha + \beta t + \mu_{it}$, t=1..39, Z = X, M, T;

b) Fiji, Kiribati, Macao China, New Caledonia, Papua New Guinea, French Polynesia, Samoa, Solomon Islands, Tonga, Vanuatu;

c) Cyprus, Faeroe Islands, Greenland, Hungary, Iceland, Norway, Poland, Switzerland, Turkey;

d) Iran Islamic Rep., Iraq, Jordan, Lebanon, Syrian Arab Rep., Yemen Rep.;

e) Algeria, Djibouti, Libya, Malta, Morocco, Tunisia.

Table A.4: Shares in the World non-fuel trade

Country/Region	Exports % of World [a)]			Imports % of World		
	Average	1962	2000	Average	1962	2000
OECD countries	80.29	82.00	69.11	73.36	75.11	67.24
EU- 15 members	46.91	48.06	36.30	43.29	46.91	32.30
USA	14.75	17.96	14.36	15.39	13.20	21.31
Americas	24.20	29.98	25.45	25.32	26.11	32.45
NAFTA	20.48	24.26	22.60	21.11	19.25	29.19
Latin America and Caribbean	4.64	6.46	6.04	5.50	7.90	6.84
South America	2.92	4.28	2.36	3.01	5.01	2.42
MERCOSUR	1.90	2.46	1.57	1.48	2.44	1.47
CARICOM	0.15	0.25	0.09	0.32	0.50	0.20
ANDEAN Pact	0.67	1.29	0.43	1.24	2.12	0.70
CACM	0.32	0.50	0.23	0.36	0.47	0.32
Asia	21.64	12.83	32.42	18.83	13.41	26.72
China	1.71	0.68	4.99	1.50	0.53	3.68
Japan	9.23	4.39	10.01	5.25	3.87	5.74
ASEAN	3.72	2.02	7.87	4.12	2.46	6.12
Sub-Saharan Africa	2.03	3.28	0.78	2.71	3.74	1.12
SACU	0.66	0.95	0.41	0.84	1.08	0.43
UEMOA	0.25	0.36	0.09	0.26	0.39	0.10
MENA	1.26	1.66	1.41	5.24	4.49	3.25

a) i.e. World trade compute from the countries available in the sample as reported in Table A.1. However, we more than 90% of the world (non fuel) trade as reported in COMTRADE.

Table A.5: Countries per Category (number of countries/ *number in RIA*)= (150/ *96*)

	No Change **0 (4/*2*)**	**Opposite Changes >< (30/*18*)**	**Positive Change + (39/*29*)**	**Negative Change - (77/*47*)**	
OECD (22/*20*)	Switzerland*	Austria*	Denmark*	Australia*	New Zealand*
		Canada*	Finland*	Belgium-lux*	Portugal*
		France*	Iceland*	Germany*	Spain*
		Netherlands*	Ireland*	Greece*	United Kingdom*
		Sweden*	Norway	Italy*	
			United States*	Japan	
non OECD (128/*76*)	Central African	Algeria	Antigua and Barbuda*	Afghanistan	Mauritius*
	Rep.*	Belize*	Bahamas*	Angola*	Mexico*
	Nigeria	Brunei*	Bahrain*	Argentina*	Mozambique*
	South Korea	Cameroon*	Benin*	Bangladesh	Myanmar*
		Cote d'Ivoire*	Brazil*	Barbados*	Netherlands Antilles
		Cyprus*	Burkina Faso*	Bermuda	New Caledonia
		Faeroe Islands	Cape Verde	Bolivia*	Nicaragua*
		Gambia	Chad*	Burundi	Niger*
		Greenland	Chile	China	Pakistan
		Honduras*	Comoros	Colombia*	Panama
		Israel*	Congo*	Costa Rica*	Papua New Guinea
		Kiribati	Djibouti	Cuba	Paraguay*
		Lao PDR*	Dominica*	Dominican Rep.	Peru*
		Libya	Gabon*	Ecuador*	Philippines*
		Macao	Jordan*	Egypt*	Poland*
		Mali*	Kuwait*	El Salvador*	St Pierre and
		Sri Lanka	Lebanon*	Fiji	Miquelon
		St. Lucia*	Liberia	French Polynesia	Samoa
		Suriname	Malta	Ghana	Sierra Leone
		Syria	Mauritania	Grenada*	Solomon Islands
		Thailand*	Montserrat*	Guatemala*	Somalia
		Tonga	Morocco*	Guyana	South Africa*
		Yemen	Nepal	Haiti	Sudan
		Zaire*	Oman*	Hong Kong	Taiwan
		Zimbabwe*	Qatar*	Hungary*	Tanzania*
			Rwanda	India	Trinidad and Tobago*
			Saudi Arabia*	Indonesia*	Tunisia*
			Senegal*	Iran	Turkey*
			Seychelles*	Iraq	Uganda*
			Singapore*	Jamaica*	Uruguay*
			St. Vincent and the	Kenya*	Vanuatu
			Grenadines*	Madagascar*	Venezuela, RB*
			Togo*	Malawi*	Vietnam*
			Unit. Arab Emirates*	Malaysia*	Zambia*

*** Countries in a regional integration agreement.**

No Change; $\left|\Delta d_i^X\right| < 5.5\%$ and $\left|\Delta d_i^M\right| < 5.5\%$

Opposite Changes; ($\Delta d_i^X < -5.5\%$ and $\Delta d_i^M > 5.5\%$**)** or **(** $\Delta d_i^X > 5.5\%$ and $\Delta d_i^M < -5.5\%$**)**

Positive Change ($\Delta d_i^X > 5.5\%$ and $\Delta d_i^M > 5.5\%$**)** or **(** $\Delta d_i^X > 5.5\%$ and $\left|\Delta d_i^M\right| < 5.5\%$**)** or **(** $\left|\Delta d_i^X\right| < 5.5\%$ and $\Delta d_i^M > 5.5\%$**)**

Negative Change ($\Delta d_i^X < -5.5\%$ and $\Delta d_i^M < -5.5\%$**)** or **(** $\Delta d_i^X < -5.5\%$ and $\left|\Delta d_i^M\right| < 5.5\%$**)** or **(** $\left|\Delta d_i^X\right| < 5.5\%$ and $\Delta d_i^M < -5.5\%$**)**